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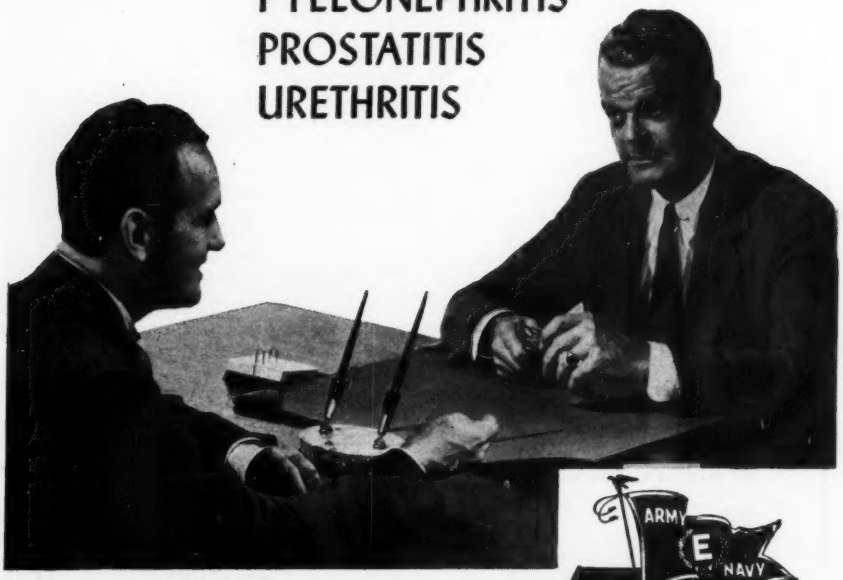

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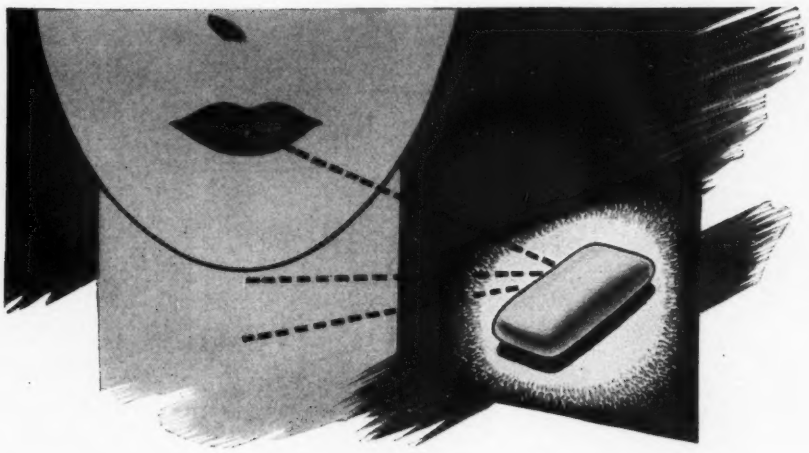

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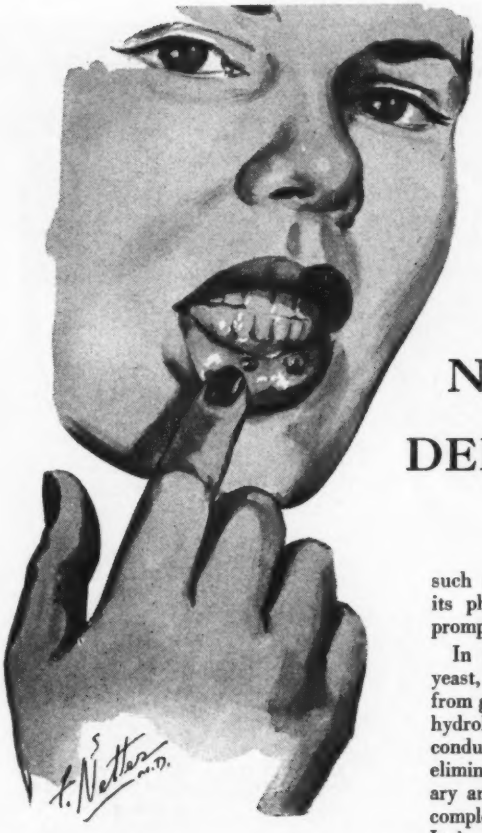

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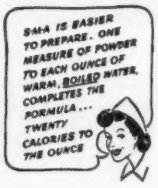
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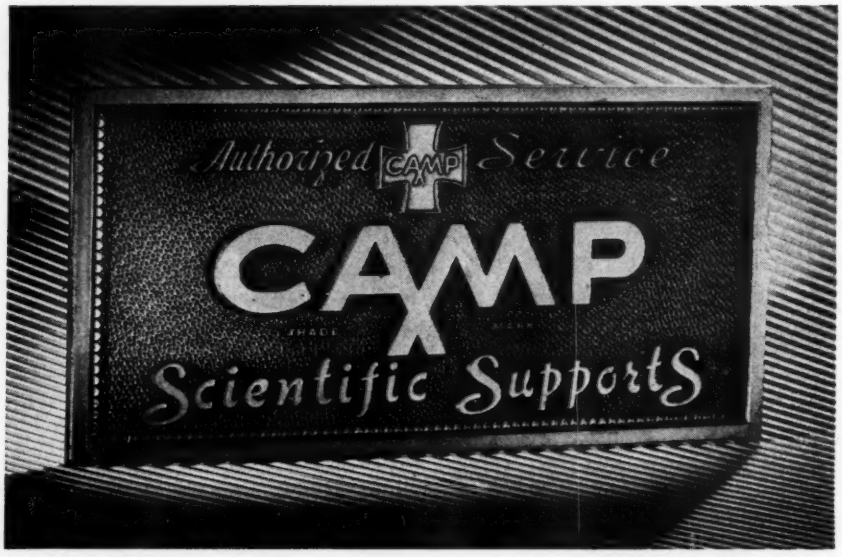

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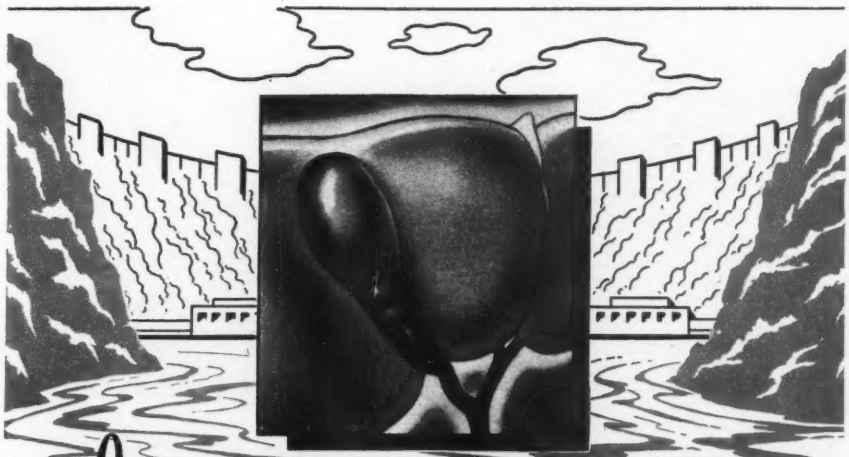

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AVERAGE DOSE:
1 or 2 Ketochol tablets 3 times daily.

HOW SUPPLIED:
Bottles of 100 and 500 tablets.

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G·D·SEARLE & CO·
ETHICAL PHARMACEUTICALS SINCE 1888
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New York Kansas City San Francisco

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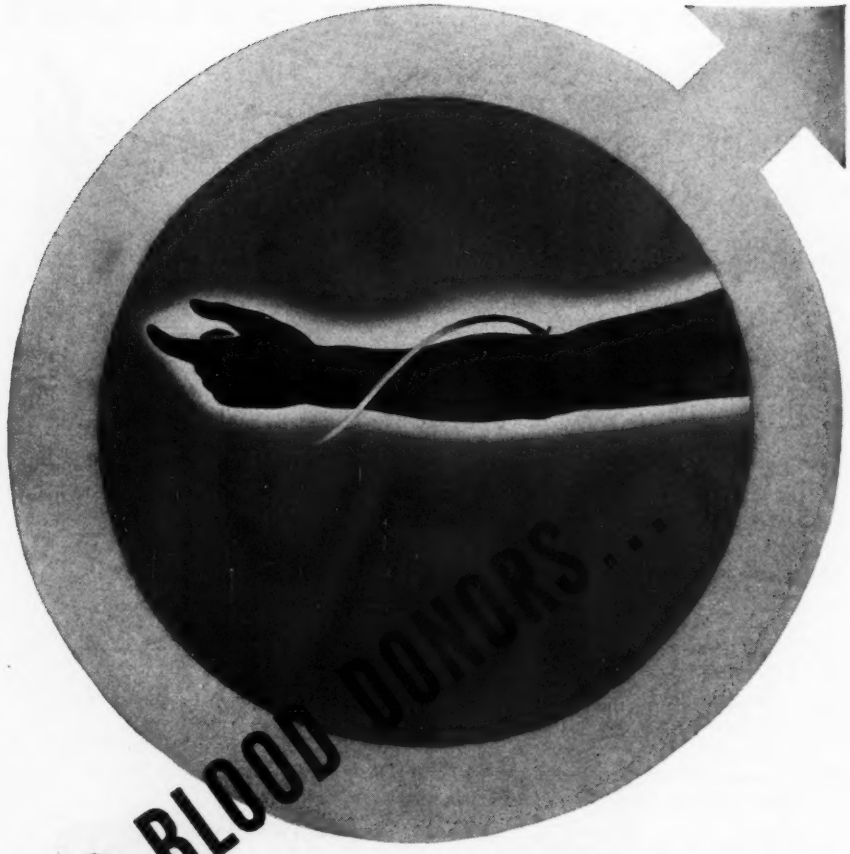

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Ferrous Iron Sealed from the Air but not from the Patient

†Fowler and Barer: "Rate of Hemoglobin Regeneration in Blood Donors." J.A.M.A., 118:421:1942.
*Reg. U. S. Pat. Off.

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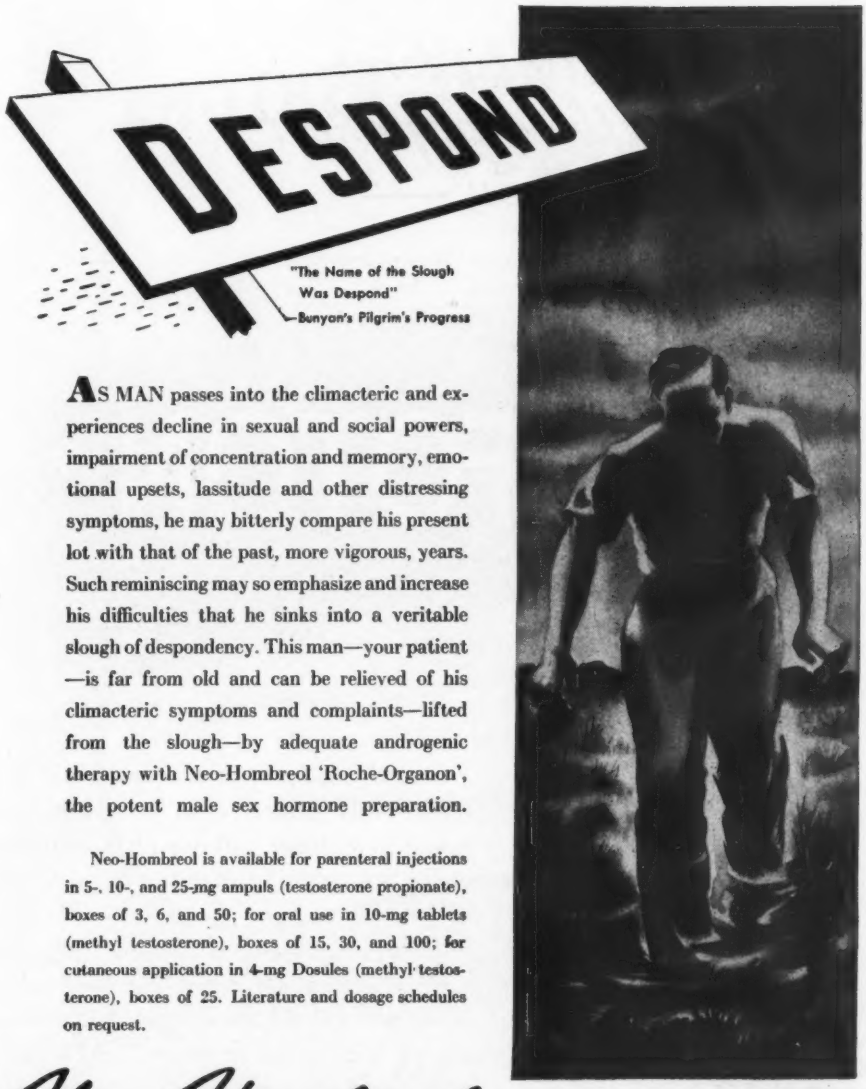

AS MAN passes into the climacteric and experiences decline in sexual and social powers, impairment of concentration and memory, emotional upsets, lassitude and other distressing symptoms, he may bitterly compare his present lot with that of the past, more vigorous, years. Such reminiscing may so emphasize and increase his difficulties that he sinks into a veritable slough of despondency. This man—your patient—is far from old and can be relieved of his climacteric symptoms and complaints—lifted from the slough—by adequate androgenic therapy with Neo-Hombreol 'Roche-Organon', the potent male sex hormone preparation.

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Sulfur . . . . . ⅓ gr.
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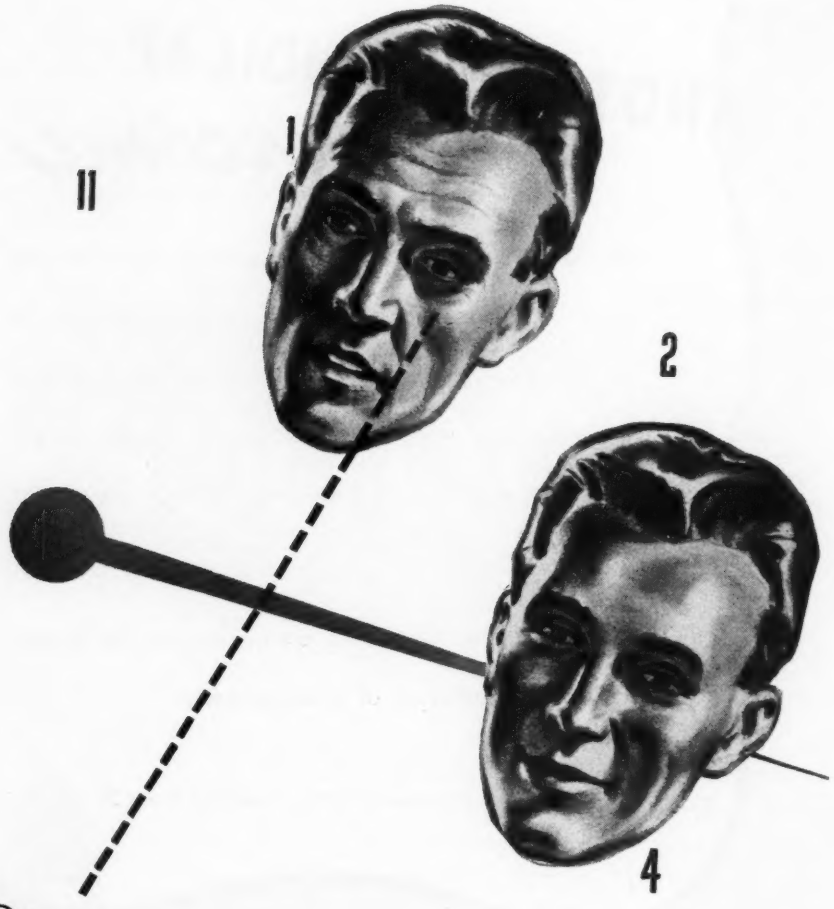

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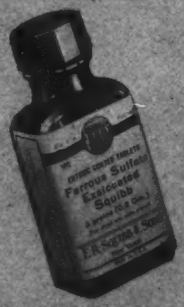
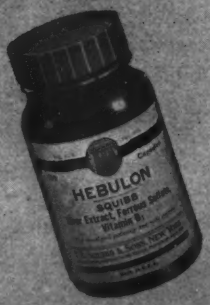


★IRON with B_1

★IRON with B-Complex



OBVIOUSLY, the selection of a hematinic for the treatment of secondary anemia depends to a large extent upon the needs of the individual patient. Some patients do well with iron alone; others require B_1 in addition to iron; still others should have the benefit of iron with the B Complex.

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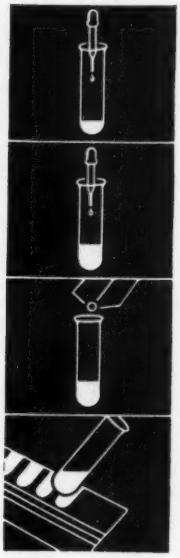
❶ *5 drops urine*



❷ *10 drops water*

❸ *Drop in tablet*

❹ *Allow for reaction, then compare with color scale.*

By substituting Clinitest Urine-Sugar Analysis Tablets for the usual type of reagent solution, you effect these advantages:

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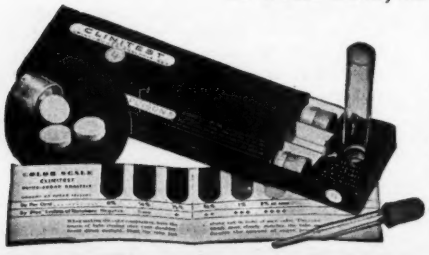

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Kantor, J. L.: Digestive Disease and Military Service, Jnl. A. M. A., Sept. 26, 1942.

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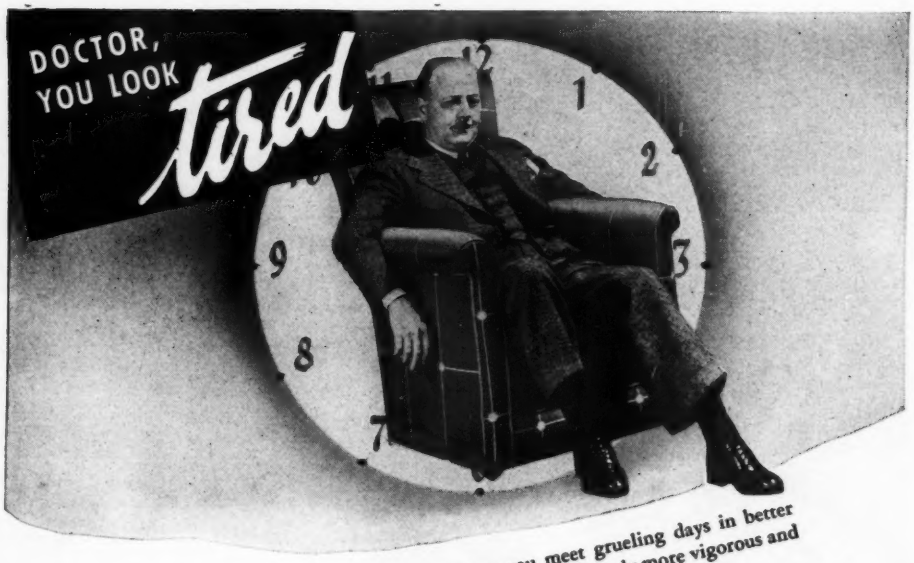

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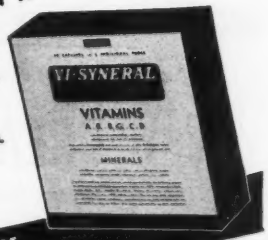

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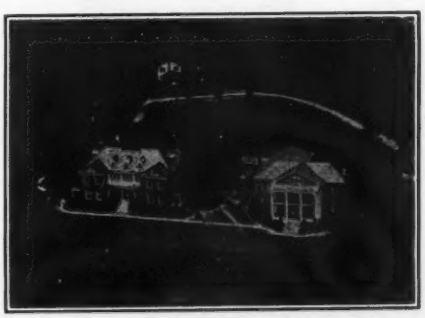

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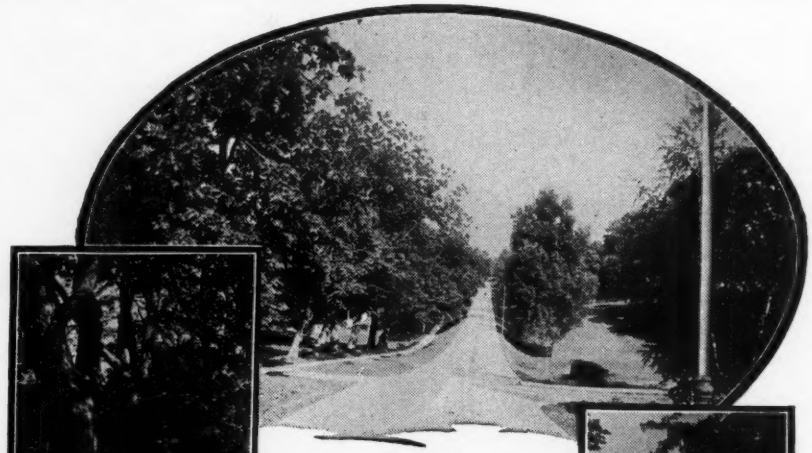

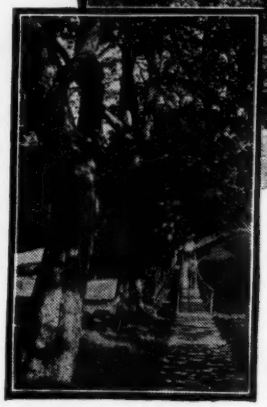

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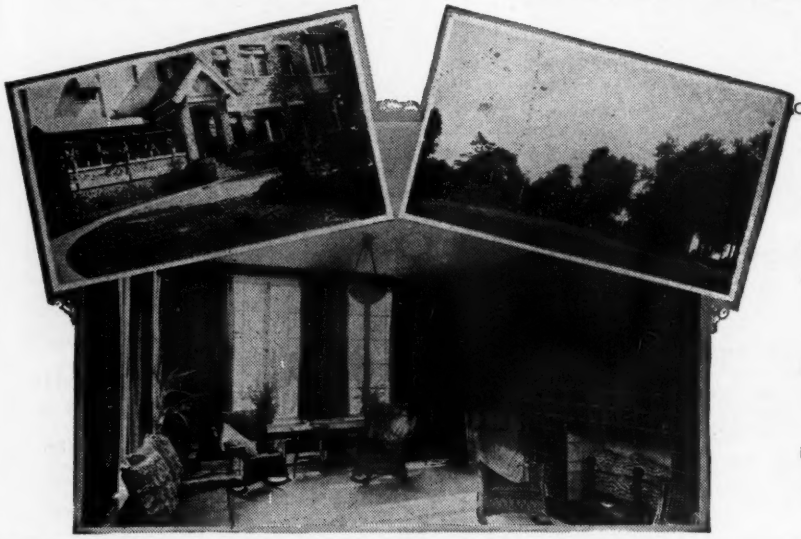

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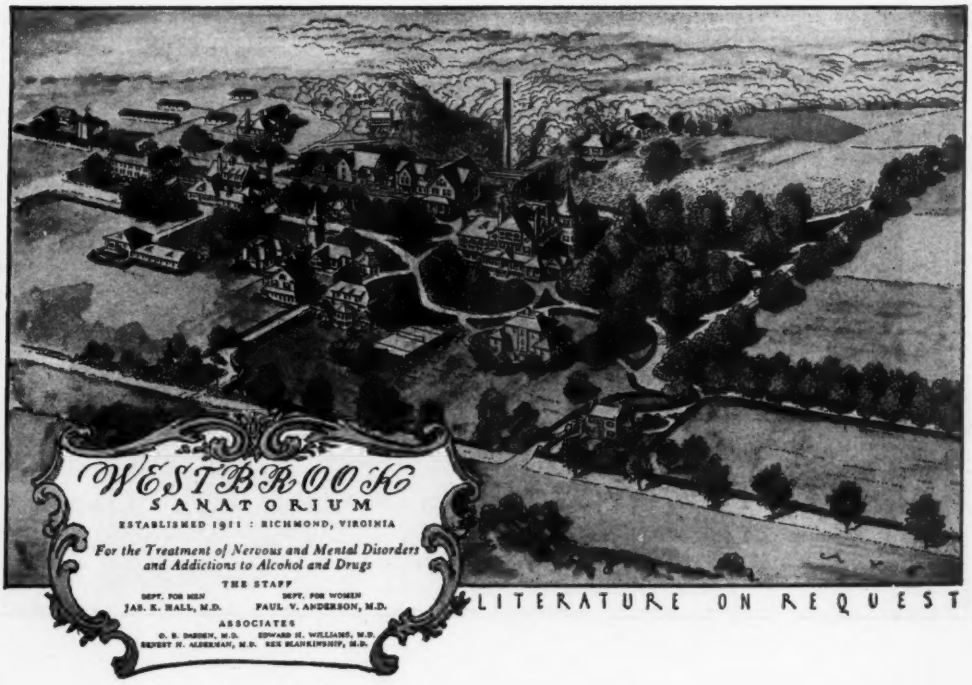

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THE USE OF AN INTRAPELVIC COAGULUM IN PYELOLITHOTOMY*

PRELIMINARY REPORT

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Durham, North Carolina

We wish at this time to present an entirely different approach to the problem of surgical removal of small renal calculi. The incidence of recurrence of renal stones after pyelolithotomy is too high, and this is due, in the majority of cases, to incomplete removal of stones at the time of operation. A new technic for pyelolithotomy is being developed which promises to insure complete removal of all free renal calculi regardless of their size or position within the kidney pelvis. A coagulable substance is injected into the renal pelvis at open operation. The resulting clot completely fills the pelvis and forms a perfect mold of all of its ramifications. Within this coagulum are incorporated all free renal calculi. The coagulum, together with all stones enmeshed within it, may then be removed through a pyelotomy incision.

This deliberate production of a clot within the renal pelvis occurred to us after an experience undoubtedly common to most urologists. Following a prolonged, traumatic, and apparently futile exploration of the kidney for a small elusive stone, a blood clot was removed from the renal pelvis, within which the small calculus was entrapped. In order to duplicate this accidental occurrence at will, it became necessary to find a suitable coagulating substance. Such a material should ideally have the following properties: (1) It should be fluid so that it can be injected into the renal pelvis and fill it completely; (2) it should coagulate uniformly and completely within a short period of time, but not until after a latent period sufficiently long to assure the complete filling of all calyces before coagulation; (3) the strength of the coagulum should be sufficiently great within a short time after injection of the substance to permit its withdrawal intact and to deliver any calculi contained within it; (4) the coagulum should be malleable and elastic enough to permit withdrawal of the mold of each calyx through its narrower infundibulum and also to allow removal of the entire clot through a short incision in the renal pelvis; (5) it should be non-injurious to the kidney; (6) the coagulum should spontaneously dissolve or disintegrate so that if a fragment were accidentally left within the pelvis, it would not remain as a foreign body to cause further stone formation; and (7) the properties of the coagulable substance should be unaffected by contact or mixture with small amounts of urine or blood.

Pyelolithotomy carried out in this fashion would have the following theoretical advantages: (1) Trauma to the interior of the kidney caused by blind exploration with stone forceps would be avoided; (2) all small free renal calculi, regardless of their size, number, or position within the pelvis would be removed; (3) complete surgical mobilization of the kidney would be unnecessary, as exposure of the renal pelvis alone should give adequate exposure for the procedure. One would not expect the coagulum to remove a calculus adherent to the wall of the pelvis nor a caliceal calculus larger than the infundibulum through which it must pass. A small intrarenal pelvis would present its usual contraindication to pyelolithotomy.

Of various substances investigated up to the present time, fibrinogen obtained from human plasma most nearly satisfies the theoretical criteria which we have outlined for the coagulable substance. Fibrinogen is that fraction of plasma globulin which is the immediate precursor of

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fibrin, and is soluble in normal saline solution, but insoluble in water. Fibrinogen solution is rapidly converted into a fibrin clot by the addition of thrombin or clotting globulin, and may be sterilized by passage through a Seitz filter without altering its property of coagulation. At room temperature it is slowly denatured so that its ability to clot is lost within a few days. By freezing or lyophilizing fibrinogen solution, however, its clotting properties may be preserved for weeks or months. The supply of human fibrinogen is limited, as a liter of human plasma yields only from 40 to 50 c. c. of concentrated fibrinogen solution.*

As a coagulating agent we have used "clotting globulin" (Lederle).† This is a fraction of globulin derived from rabbit plasma, the action of which in clotting fibrinogen is identical with that of thrombin. It is furnished commercially in a 10 per cent solution, and for our use in coagulating fibrinogen is diluted with four parts of normal saline to produce a 2 per cent solution. The coagulum is formed by the mixture of ten parts of human fibrinogen solution to one part of 2 per cent clotting globulin. This coagulum has most of the properties of the theoretically ideal substance. Coagulation begins approximately thirty seconds after mixture and is complete at the end of sixty seconds. The speed of coagulation can be hastened by increasing and retarded by decreasing the concentration of clotting globulin. The tensile strength of the coagulum progressively increases to a maximum within thirty minutes after its formation. Within five minutes after mixture, its tensile strength is usually from ten to fifteen times as great as that of human blood clot, and from three to eight times as great as that of clotted human plasma. The coagulum is non-injurious to the kidney and spontaneously disintegrates in human urine at 37° C. within eighteen to twenty-four hours. The various properties of the coagulum are unaffected by the addition of small amounts of human urine or blood except as they act as diluting factors. A detailed report of the preparation and properties of human fibrinogen and fibrinogen coagulum is being presented elsewhere.††

TECHNIC OF COAGULUM PYELOLITHOTOMY

(A) *General Considerations.*—Due to the fact that fibrinogen solution becomes denatured and the resulting coagulum decreases in tensile strength when the solution remains at room temperature, the material, if frozen, should be thawed, or if lyophilized, dissolved, just prior to operation. All syringes, needles, catheters and containers which come in contact with the fibrinogen prior to its injection should be rinsed with normal saline solution to prevent premature coagulation of the substance.

(B) *Operative Technic.*—(1) After exposing the kidney pelvis and upper ureter, the lumen of the ureteropelvic junction is gently occluded with a suitable instrument or by means of pressure with the fingers to prevent the escape of coagulating material into the ureter.

(2) A small incision, approximately 4 mm. long, is made into the renal pelvis.

(3) A No. 12 French urethral catheter with two eyes is introduced into the pelvis through the small incision. If the catheter does not fit the opening snugly it may be made to do so by grasping one edge of the incision with a mucosa clamp. The urine is then aspirated from the pelvis.

(4) The kidney pelvis is next filled with normal saline solution and then completely aspirated by means of a graduated syringe. The amount of normal saline necessary to distend the pelvis to a moderate degree of tenseness may be used as an index of pelvic capacity.

(5) The pelvis is then lavaged with a solution of fibrinogen, after which all fluid is aspirated.

(6) Fibrinogen solution, in an amount almost equal to the predetermined capacity of the renal pelvis, is next injected through the urethral catheter into the renal pelvis. Simultaneously, by means of a syringe and needle, an assistant injects one-tenth that amount of 2 per cent clotting globulin through the wall of the urethral catheter into its lumen, so that the two substances are intimately admixed as they enter the renal pelvis.

(7) Five minutes are allowed to elapse.

(8) After removing the urethral catheter, the usual pyelotomy incision is made by extending the initial small incision as desired.

(9) The coagulum then partially extrudes through the pyelotomy incision and may be grasped with ring forceps and slowly, but firmly, withdrawn. It should remove enmeshed within itself all free calculi from the renal pelvis.

(10) The pyelotomy incision is usually left open or closed only partially to insure against ureteral obstruction during the first postopera-

*We are now investigating bovine fibrinogen as a possible substitute for the human material.

†We wish to express our thanks to Lederle Laboratories, Inc., for supplying us with generous quantities of this material.

††To be published in the *Journal of Urology*.

tive day by any portion of the clot which might remain in the renal pelvis.

The technic outlined above is that in use at the present time. It is still imperfect and is being modified as accumulated experience indicates. The following representative experiments are a few of those which have aided in its development.

The pelvis of a kidney recently removed at autopsy was injected with human fibrinogen solution and clotting globulin. When removed, the resulting coagulum formed a perfect mold of the renal pelvis and the delicacy with which the calices and infundibula were reproduced indicated complete filling of the pelvis. Three small calculi were then placed within the kidney pelvis and, after closing the pyelotomy, the injection was repeated. On removal of this coagulum the calculi were withdrawn embedded within it (*Fig. 1*).

Theoretically, a coagulating substance injected under pressure into the renal pelvis might enter the collecting tubules of the kidney and, after clotting, obstruct them. To investigate this possibility, the left kidneys of two dogs were exposed under ether anesthesia and a fibrinogen coagulum created in each of their pelves and left in place. After three and seven days, respectively, the animals were sacrificed and the kidneys were found to be grossly and histologically normal. There was no coagulum present in either pelvis nor was there any evidence of fibrin in the collecting tubules.

A second experiment was carried out on a patient undergoing nephrectomy for chronic pyelonephritis and hydronephrosis. After exposure of the kidney, the ureter was ligated at the uretero-pelvic junction. After aspiration of the urine, the pelvis was completely filled with fibrinogen coagulum, as previously described. Five minutes later the coagulum was removed through a pyelotomy incision, after which nephrectomy was carried out. Histologic sections of the kidney showed only the usual changes of chronic pyelonephritis, no fibrin being demonstrable within the collecting tubules of the renal papillae (*Fig. 2*).

The Effect of Coagulum Pyelolithotomy on Renal Function.—In *Cases 3* and *4*, the kidney was drained after operation by means of a nephrostomy tube. Although differential 'phthalein excretion was not obtained in either of these cases prior to operation, a comparison of the preoperative voided 'phthalein with the postoperative 'phthalein excretion of the operated kidney is of interest. In *Case 3*, the preoperative voided 'phthalein showed an appearance time of five minutes, 30 per cent excreted the first half hour, a total of 70 per cent being excreted in two hours. Three days after operation, the 'phthalein excretion through the left nephrostomy tube showed the appearance time to be undetermined, 20 per cent of the dye was excreted the first hour after injection, 38 per cent in 2 hours. In *Case 4*, the preoperative voided 'phthalein showed an appearance time of five minutes, 60 per cent excreted the first half hour, 85 per cent excreted in two hours. Twenty-four hours after operation, 'phthalein appeared from the right nephrostomy tube in five minutes, 18 per cent excreted the first half hour, 33 per cent in two hours. Three days after operation, 'phthalein

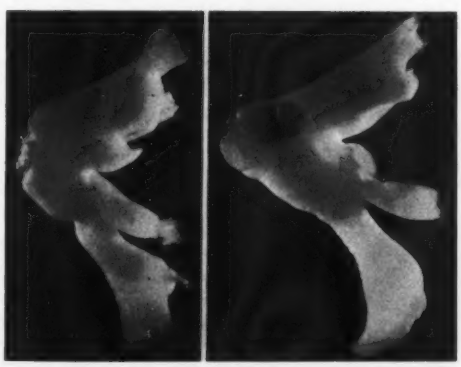

Fig. 1

Coagulum formed in autopsy kidney. Perfect mold of pelvis indicates complete filling. Second coagulum removed calculi placed within the same kidney.

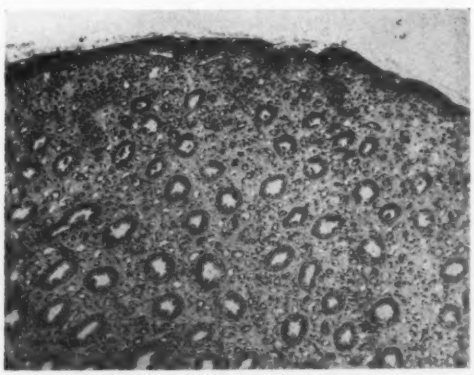

Fig. 2

Photomicrograph of tip of renal papilla (human). A fibrinogen coagulum was formed in the pelvis just prior to nephrectomy. Note absence of fibrin in collecting tubules.

appeared from the right kidney in five minutes, 30 per cent excreted in the first half hour, 40 per cent in two hours. In each case, three days after operation, the two-hour excretion of 'phthalein by the operated kidney was approximately 50 per cent of the combined excretion in two hours by both kidneys prior to operation. From this observation it appears that renal function returns to approximately normal within two or three days following coagulum pyelolithotomy and nephrostomy.

Fig. 3 A, Case 1, Right Kidney
Preoperative x-rays.

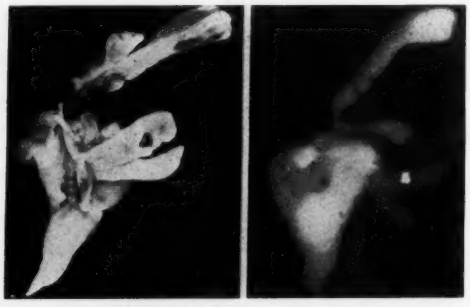

Fig. 3 B, Case 1, Right Kidney
Photograph and x-ray of operative specimen (ureteral calculus removed but not illustrated).

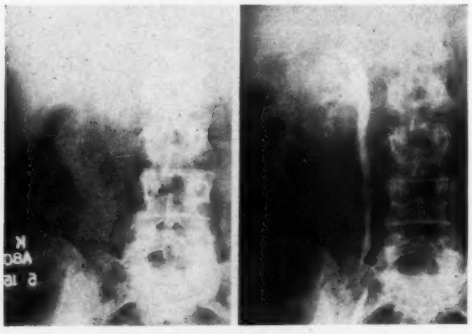

Fig. 3 C, Case 1, Right Kidney
Postoperative x-rays. Failure to remove caliceal calculus apparently due to narrow infundibulum.

CASE REPORTS

Case 1 (*Duke Hospital A 80194*).—A 44-year-old woman had a calculus 11 x 12 mms. in diameter in the right lumbar ureter. In addition, two small stones were present in the right renal pelvis, one measuring 4 x 3 mms., the other 8 x 8 mms. in diameter (*Fig. 3 A*). A retrograde pyelogram showed that the larger of the two renal calculi lay within one of the middle calices whose infundibulum was fairly large. The small stone lay in the upper calyx. A ureteral catheter was introduced into the right kidney pelvis and left indwelling for twenty-four hours prior to operation.

Operation.—On April 29, 1942, the right kidney and upper ureter were exposed by a subcostal muscle-cutting incision and the ureteral calculus removed in the usual fashion. Coagulum pyelolithotomy as described above was then carried out, the capacity of the pelvis being 22 c. c. On withdrawal of the coagulum, the smaller renal calculus was delivered embedded within the clot (*Fig. 3 B*). Prolonged exploration of the pelvis failed to reveal the remaining stone. The patient's postoperative course was uneventful. Urinary drainage stopped on the sixth postoperative day and the patient was discharged seventeen days after operation. Plain x ray and retrograde pyelogram taken prior to discharge (*Fig. 3 C*) showed the larger of the renal calculi still present in the same calyx in which it was situated prior to operation.

This remaining stone was apparently mechanically trapped within the calyx by a narrow infundibulum. Preoperative catheter drainage of the hydronephrotic kidney so reduced the caliber of the infundibulum that the stone was then too large to be withdrawn through it by the coagulum.

Case 2 (*Duke Hospital A 82515*).—A 47-year-old woman had a calculus measuring 9 x 11 mms. in diameter in the left lumbar ureter. In the region of the left kidney pelvis was a small stone measuring 4 x 3 mms. and a round stone 8 mms. in diameter (*Fig. 4 A*). Pyelogram of the left kidney could not be secured because of complete obstruction by the ureteral calculus.

At operation, May 2, 1942, the left kidney and upper ureter were exposed and the ureteral calculus removed in the usual fashion. Coagulum pyelolithotomy was then carried out, the capacity of the renal pelvis being 33 c. c. The clot was removed in three pieces, in one of which the smaller of the renal calculi was imbedded. The second renal calculus was not incorporated within the clot, but was readily removed with stone forceps (*Fig. 4 B*). Both the ureterotomy and pyelotomy incisions were left open. Convalescence was uncomplicated except for prolonged urinary drainage which finally ceased on the twenty-third postoperative day. Postoperative x-rays showed complete removal of the calculi and reduction of the hydronephrosis (*Fig. 4 C*).

The failure to include the larger of the two renal calculi within the coagulum was thought to be due to too rapid coagulation of the clotting mixture. In this case we used concentrated clotting globulin which subsequently was found to cause coagulation of the fibrinogen within a few seconds after mixture. If the fibrinogen solution coagulates before completely surrounding a calculus, it will merely displace the stone peripherally against the wall of the pelvis and fail to entrap it.

Case 3 (Duke Hospital A 87314).—A 3-year-old boy

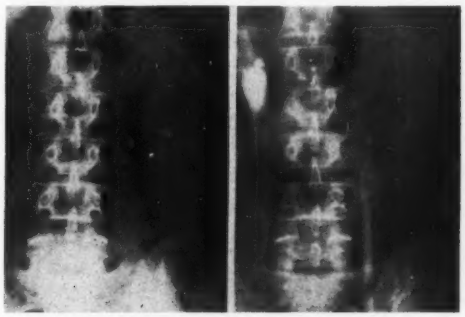

Fig. 4 A, Case 2, Left Kidney.
Preoperative x-rays.

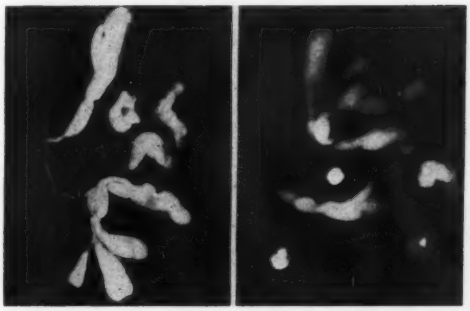

Fig. 4 B, Case 2, Left Kidney
Photograph and x-ray of operative specimen.

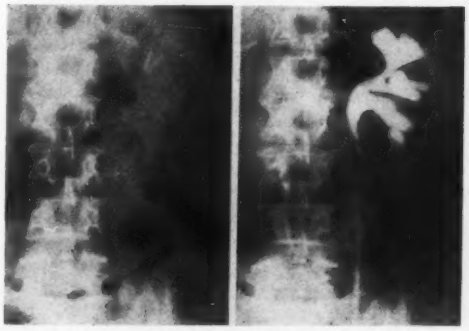

Fig. 4 C, Case 2, Left Kidney
Postoperative x-rays. One renal calculus removed independently of coagulum.

Fig. 5 A, Case 3, Left Kidney
Preoperative x-rays.

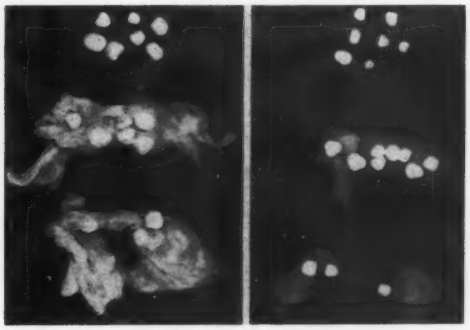

Fig. 5 B, Case 3, Left Kidney
Photograph and x-ray of operative specimen.

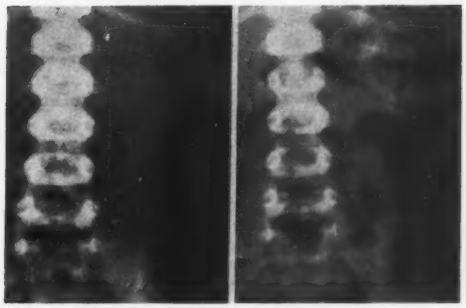

Fig. 5 C, Case 3, Left Kidney
Postoperative x-rays. Failure to remove one of nineteen calculi.

had had two previous operations upon each kidney for the removal of stones. He was found to have bilateral ureteropelvic junction strictures, bilateral hydronephrosis, and multiple bilateral renal calculi. At least seventeen stones between 5 and 8 mms. in diameter could be identified in the region of the left kidney pelvis (*Fig. 5 A*).

At operation, September 2, 1942, the left kidney was exposed and the pelvis and upper ureter freed from dense adhesions. The pelvis was opened and seven rounded calculi were readily removed with stone forceps. The pyelotomy incision was then temporarily closed around a urethral catheter by means of mucosal clamps and after preliminary lavage, 9 c. c. of coagulating material was injected. Withdrawal of the resulting coagulum removed eight calculi incorporated within it. Exploration of the kidney pelvis with stone forceps failed to reveal any other stones. A second injection of coagulating material was made and removal of this coagulum delivered three additional stones imbedded within it (*Fig. 5 B*). No other stones could be felt on further exploration of the pelvis with forceps. An unsatisfactory x ray of the kidney on the operating table showed no opacity, so nephrostomy through the lower calyx was carried out for postoperative irrigation of the pelvis. During convalescence, plain x-ray and intravenous urograms showed a single free calculus remaining in the left renal pelvis (*Fig. 5 C*). The reason for failure to remove this single stone is not clear.

Case 4 (*Duke Hospital A 66893*).—An 18-year-old boy had one calculus measuring 2.5 x 2 cms. in diameter blocking the outlet of the right renal pelvis and four rounded stones from 5 to 6 mms. in diameter in a dilated lower calyx. No other calculi could be visualized in the region of the right kidney (*Fig. 6 A*).

At operation, September 16, 1942, after exposing the right kidney by the usual incision, the large calculus could be felt within the pelvis. A small pyelotomy was made just below the calculus and a No. 12 urethral catheter splinted with a probe was introduced beyond the calculus into the lower portion of the pelvis. After preliminary irrigation, sixteen c. c. of the coagulating mixture were injected and allowed to clot. Pyelotomy was then performed and the large stone was removed with forceps. The coagulum then presented and was withdrawn from the kidney. Incorporated within it were two of the previously visualized small stones and also innumerable tiny calcareous fragments, most of which were less than 1 mm. in diameter. A third calculus which was not incorporated, but which had been drawn into view by the coagulum was removed with forceps. Digital exploration of the pelvis failed to reveal the fourth remaining stone so the kidney pelvis was reinjected. When removed, this coagulum contained the fourth stone and again innumerable tiny calculous fragments which had not been visualized on x-ray (*Fig. 6 B*). Because of the abundance of these fragments, nephrostomy was carried out through the lower calyx for postoperative irrigation of the pelvis. Postoperative x-rays have shown a few fine opacities in the region of the right kidney which probably represent some of these tiny fragments remaining in the kidney (*Fig. 6 C*).

Case 5 (*Duke Hospital A 87797*).—A 42-year-old man had a small stone measuring 12 x 5 mms. in diameter which for six months had intermittently blocked the pelvis of the left kidney and caused attacks of severe pain. The stone would not descend into the ureter, but on each occasion would spontaneously drop back into

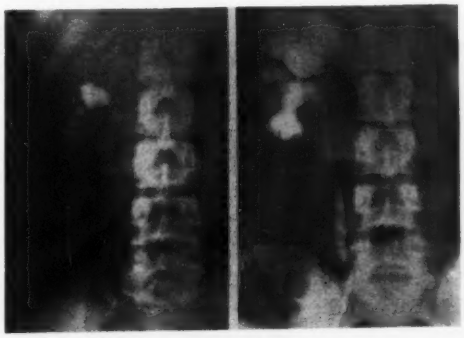

Fig. 6 A, Case 4, Right Kidney
Preoperative x-rays.

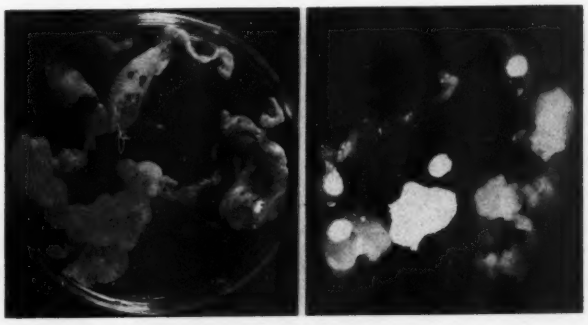

Fig. 6 B, Case 4, Right Kidney
Photograph and x-ray of operative specimen.

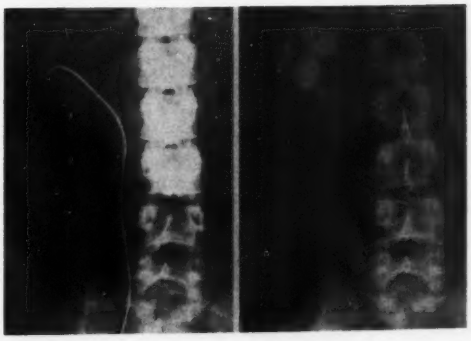

Fig. 6 C, Case 4, Right Kidney
Postoperative x-rays. Three small and innumerable tiny calculi removed by coagulum.

the pelvis within a few hours and terminate the attack. At the time of preoperative x-rays, the stone lay at the ureteropelvic junction, the pyelo-ureterogram appearing normal (*Fig. 7A*).

At operation, October 16, 1942, the left renal pelvis was exposed and the calculus could not be palpated at the ureteropelvic junction. Coagulum pyelolithotomy was then performed and the small stone was readily removed enmeshed within the clot (*Fig. 7 B*). Postoperative x-ray showed removal of the stone (*Fig. 7 C*).

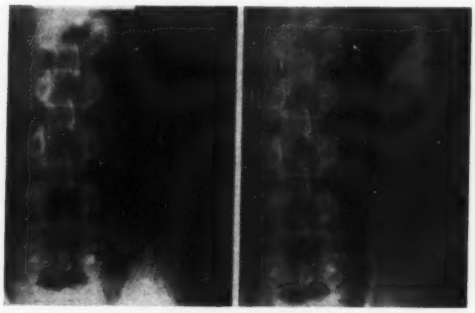

Fig. 7 A, Case 5, Left Kidney
Preoperative x-rays.

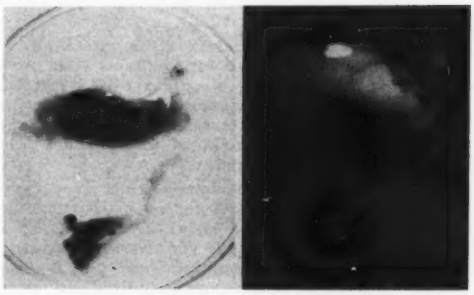

Fig. 7 B, Case 5, Left Kidney
Photograph and x-ray of operative specimen.

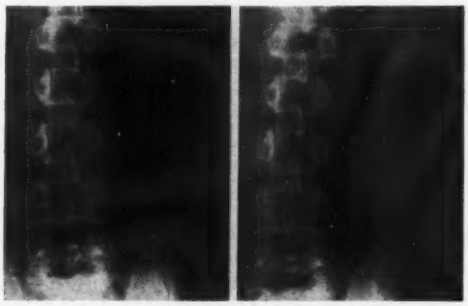

Fig. 7 C, Case 5, Left Kidney
Postoperative x-rays. Single small calculus removed by coagulum.

This case illustrates the ease with which a single small free stone may be removed by this technic. Although the patient was five feet eleven inches tall and weighed 230 pounds, adequate exposure of the renal pelvis for this procedure was obtained through an incision 19 cm. (7.6 inches) in length.

DISCUSSION

The incidence of recurrence of stone following pyelolithotomy is high, varying in different reports from 15 to over 40 per cent of well followed groups of cases. The correction of ureteral or lower urinary tract obstruction, correct repositioning of the kidney at the time of operation, elimination of urinary infection, and excision of pathologic calices are all procedures of proven worth in the prevention of true recurrence of stone. It is generally conceded, however, that the majority of so-called recurrent calculi are not true, but false recurrences, and are due to incomplete removal of stones at the time of operation. The reasons for incomplete removal of calculi at pyelolithotomy are manifold. The bizarre shape of the renal pelvis may make thorough exploration of its interior difficult or impossible. A short renal pedicle or perinephric adhesions may hinder delivery of the kidney and accentuate the difficulty in exploring its interior. Soft stones may be fragmented during removal and any remaining fragment may form the nidus of a recurrent calculus. A small stone may move from one calyx to another during operation and elude detection. Again, blood clot may cover small stones so that crepitus cannot be elicited by exploring forceps and identification by digital palpation is made difficult. The x-ray opacity of a large stone may obscure additional small stones so that their presence is unsuspected. Minute calculi and radiolucent stones may not be revealed by x-ray. The only special procedures now employed at the time of operation for insuring more complete removal of stones are irrigation of the kidney pelvis and x-ray or fluoroscopy of the kidney at the time of operation. Recently interest has centered upon the chemical dissolution of calculi by irrigation of the renal pelvis with various acid solutions. If successful, and used routinely after operation, this procedure may prove to be of considerable value in lowering the incidence of false recurrence of stone. It is apparent, however, that there is considerable need for improvement in our technic for pyelolithotomy.

All demonstrable stones have been removed

by the coagulum alone in only one of the five clinical cases of coagulum pyelolithotomy reported in this paper. In one case, the failure to remove a caliceal calculus was obviously due to the mechanical factor of a narrow infundibulum. In three other cases, some, but not all, of the stones were enmeshed within the coagulum and removed. This failure of the coagulum uniformly and invariably to incorporate within itself all free calculi is due to the fact that we have as yet been unable to standardize our materials and more fully to develop or alter certain of their properties. Fibrinogen is an unstable biological product and the properties of different preparations, even when made by the same technic, may vary considerably. It has been necessary to devise or select new methods for the preparation, preservation and testing of our materials. The quantity of human fibrinogen so far available has been too small for the large number of experiments that will be necessary to produce a coagulum perfectly suited for our purpose.

The creation and use of an intrapelvic coagulum for pyelolithotomy which we have described in this paper should theoretically overcome the usual reasons for incomplete removal of renal stones. The technic is as yet too imperfect and in too early a stage of development to lay down indications for its use or to analyze our results. It is presented at this time with the hope of stimulating others to help in its development.

SUMMARY

A new technic for the operative removal of small renal calculi and calculous fragments is presented. An intrapelvic coagulum is formed by the simultaneous injection of clotting globulin and human fibrinogen into the renal pelvis. This coagulum theoretically incorporates within itself all free calculi present, regardless of size or location, and on withdrawal of the coagulum through a pyelotomy incision the stones are removed. The coagulum is apparently harmless to the kidney and, should any portion of the clot remain, it spontaneously disintegrates within eighteen to twenty-four hours.

This technic has been used in five clinical cases of human nephrolithiasis without apparent ill effect. Although still imperfect and as yet in an experimental stage, calculi have been removed by this means that probably would not have been removed by pyelolithotomy as usually performed.

The laboratory and scientific investigations that have enabled us to bring this technic of coagulum pyelolithotomy to its present stage of development have obviously wandered far afield from the realm of clinical urology. We wish to express our sincere thanks for the advice and generous cooperation that have been given us by members of the departments of Physiological Chemistry, Physiology, Pathology, Urology and Experimental Surgery of the Duke University School of Medicine.

DISCUSSION (*Abstract*)

Dr. Wm. M. Coppridge, Durham, N. C.—This paper presents an entirely new approach to the removal of small renal calculi. The development of the coagulum was the result of much investigation and experimentation.

Dr. Dees seems to have ample evidence that the procedure is free from danger of injury to the kidney either chemically or as an obstructing agent.

I have seen Dr. Dees use this substance in one case. The technic employed is not difficult. The solution when injected is sufficiently fluid to disseminate throughout the entire pelvis. It coagulates quickly and the clot is remarkably pliable and tough. The procedure consumes very little time. The two types of small stones that will not respond to treatment by the coagulum method are those that are attached to the pelvic epithelium and those lying in dilated minor calyces with small infundibula.

The chief sphere of usefulness of the method, to my mind, will be in the search for fragments after operation for a larger stone. We are apt to forget that stone particles, almost microscopic in size, are just as important nuclei for recurrence as are larger ones. It is certain that our practice of lavage of the pelvis does not remove all fragments.

Those of us who have recently made some use of chemical dissolution methods for removing stones and fragments feel that greater use of these solutions postoperatively will diminish the percentage of recurrence materially. This type of treatment may be effective in these two classes of small stones that Dr. Dees' method will not remove.

We all realize that in successfully removing a stone from the kidney we have fulfilled only a small part of our obligation to the patient. The prevention of recurrence of the stone is of equal importance. Since we all agree that the leaving of particles is the chief cause of recurrence, it behooves us to study the problem and use every means at our command to combat it.

Dr. Dees has presented a method well worthy of our careful consideration. It offers another means of dealing with what, to me, is one of the most serious and difficult problems that we have to solve.

I hope that before very long the bovine fibrinogen will be made available so that some of the rest of us may be able to use it more easily.

Dr. Benj. S. Abeshouse, Baltimore, Md.—I was particularly impressed with Dr. Dees' contribution which will undoubtedly aid us in overcoming the perplexing problems associated with the removal of multiple stones in the kidney. The use of a coagulum to enmesh the

minute calcareous particles as well as larger calculi is quite ingenious. Undoubtedly with time and experience this method will prove its worth. Dr. Dees has informed us that the technic and details for making the coagulating substance will be available in the published article and that there is a possibility that this coagulable substance will be produced by a well known pharmaceutical house. I am looking forward to obtaining the coagulum and trying out this new procedure.

Dr. Dees (closing).—Very recent work with fibrinogen solution has suggested that it may well be possible to shorten the arbitrarily chosen five-minute period between injection of the coagulable material and removal of the clot. If the fibrinogen solution is first warmed to 37° C., and then coagulated by means of clotting globulin and maintained at 37° C., the development of maximum tensile strength of the clot occurs much more quickly than if the solution is maintained at room temperature. In recent preparations the maximum strength has been attained within five to ten minutes after mixture rather than after thirty minutes, as occurs at room temperature.

BRONCHOGENIC CARCINOMA*

REPORT OF A CASE DIAGNOSED FROM FIXED FROZEN SECTIONS OF SEDIMENT FROM PLEURAL EXUDATE

By DOUGLAS R. VENABLE, A.B., M.D.
Columbus, Georgia

Primary carcinoma of the lung was but a few short years ago considered a pathologic curiosity found occasionally at the postmortem table. Here again is a striking testimonial to the value of the necropsy. When diagnosticians became gradually aware, largely at first through postmortem statistics, that this important malignant neoplasm had all too long been overlooked, an impetus was given to more thorough study and newer diagnostic methods, which would enable the diagnosis of primary lung carcinoma to be made at the bedside rather than in the deadhouse. The first step in the direction of the earlier and more certain recognition of any disease entity is a consciousness on the part of the clinician of the possibility of its existence. It must naturally follow that better diagnostic methods will be evolved! A malady that was formerly not even considered in a differential diagnosis must now be excluded whenever signs and symptoms referable to such a condition are encountered. With the attention of the clinician focused upon such a possibility, it is surprising how many new cases have been added to those first few that appeared in the literature, until at length astonishment is expressed that such manifest pathology could ever have been frequently overlooked, and the wrong diagnosis have been often recorded upon the death certificate. It has been wisely said that in all cases of acute lung infection, particularly if unilateral and in a person past 40 years of age, which do not clear up within a reasonable length of time, carcinoma of the lung should be suspected. Once it is suspected, the first important diagnostic step has been taken.

The roentgenogram is of the utmost importance, and stereoscopic plates are, of course, essential, as it must be remembered that most of these pulmonary carcinomas develop in the hilar region where many overlapping shadows make the roentgenographic interpretation quite difficult. It has been found, however, that in such cases the hilus shadow is displaced towards the affected side, an observation of great significance. If the lesion is central, the shadow will be cast by the new growth alone, or by the lesion plus a surrounding area of pneumonitis, pneumonia, or lung abscess. Iodized oil injections into the bronchial tree are of great help in demonstrating intrabronchial growths, which frequently form a part of the picture, and also obstructions of branches of the bronchi by pressure of the neoplasm from without. Growths which have invaded the principal stems of the bronchus can be seen by bronchoscopy, and biopsies obtained from these for tissue examination, by which means an absolute diagnosis may often be made.

There are many advocates today of intrapulmonary aspiration biopsies, after the growth has been localized by physical examination and by the roentgenogram, and many positive diagnoses have been made in this way. That the method is at times not without grave consequences to the patient, however, is emphasized by Ochsner and Debakey[1] in a recent paper in the February, 1941, *Archives of Surgery*. The danger is twofold, that of uncontrollable hemorrhage from injury to a blood vessel, and of the spreading of the malignancy to the pleura by aspirating the tumor cells through it. On the other hand, Craver[2] has developed a special technic for making aspiration biopsies of lung tumors, employing long 18-gauge short bevel aspiration needles fitted to record syringes, and making stained smears of the small bits of tissue thus obtained.

Craver[3] says:

"In the Memorial Hospital series of 230 lung aspirations there has been observed no case of empyema, lung

*Read in Section on Pathology, Southern Medical Association, Thirty-Sixth Annual Meeting, Richmond, Virginia, November 10-12, 1942.

abscess or growth of the tumor along the puncture tract."

He does not, however, make any statement concerning the danger or even the occurrence of hemorrhage resulting from the puncture of a pulmonary blood vessel with such a large gauge needle, though such danger undoubtedly exists. I am acquainted with at least one case in which an almost fatal hemorrhage resulted from the wounding of a small branch of one of the pulmonary arteries, and secondary hemorrhages occurred several times over a period of several weeks, and only repeated large blood transfusions enabled this patient finally to recover from the effects of the loss of much blood. However, Craver was able to make a positive diagnosis of carcinoma of the lung in 58 cases, representing 33 per cent of the total number of cases in which such a positive diagnosis could be made in the series reported by him.

Also in a number of cases bits of tissue have been coughed up, which were large enough for microscopic sections to be made from them, and a positive diagnosis made in this manner. If the patient in whom this condition is suspected is cautioned to save all bits of tissue coughed up with the sputum, and to bring such material promptly to his physician, perhaps more cases can be diagnosed. And lastly, a positive diagnosis of carcinoma of the lung can be made in some cases in which the malignant growth has penetrated the visceral pleura, and produced a pleurisy with effusion. By a method attributed to Mandelbaum, the aspirated pleural fluid is at once centrifuged at high speed for about thirty minutes, and the button of tightly packed sediment thus obtained is hardened thoroughly in 10 per cent formalin and then imbedded in paraffin like a tissue. In the case that I wish to report, I modified this technic by making frozen sections of the formalin fixed pleural sediment, which resulted in some very beautiful slides which clearly proved the case to be one of bronchogenic carcinoma. This tentative diagnosis had already been made by the roentgenologist, Dr. Clark A. Wilcox, who is due full credit for a very skillful interpretation of the roentgenograms in this case.

CASE REPORT

Mr. W. J. H., a white man, 51 years of age, was admitted to the hospital with the complaint of weakness, effort syndrome, dyspnea, cough, pain in the right chest, and the expectoration of a moderate amount of purulent sputum, sometimes blood-tinged. He dated the onset of his illness to about five months prior to his entry into the hospital. The blood count was as follows: red blood cells, 4,400,000; hemoglobin 80 per cent; white blood cells 13,800. The differential leukocyte count was: polynuclears 78; eosinophils 2; large mononuclears 8; and lymphocytes 12. The urine was essentially negative except for a fair number of pus cells occasionally. Routine blood chemistry studies showed normal levels for nonprotein nitrogen, creatinine, and dextrose. The uric acid was 6 mg. per cent. The patient ran an irregular type of temperature, with frequent elevations to as high as 103° F., and this fever became more constant as the patient's demise neared. The roentgenograms showed a definite new growth in the right lung, especially in the hilar region, and later on also showed a pleural effusion occupying two-thirds of the pleural cavity. Twelve hundred cubic centimeters of this fluid were withdrawn by paracentesis. It was of a high specific gravity, amber-colored and blood tinged. It contained many pus cells and some red blood cells, besides clumps of larger cells that looked suspiciously like glandular epithelium in fresh cover slip preparations.

The entire amount of fluid was centrifuged and the resulting sediment pooled and recentrifuged in small conical 15 c. c. tubes at high speed for about thirty minutes until the sediment was so firmly packed that the supernatant fluid could be poured off without disturbing it. The tubes were then filled with 10 per cent formalin which was allowed to stand upon the sediment for 48 hours, until it had fixed it so thoroughly that the buttons of sediment could be removed without breaking them up. These were then further fixed for another twenty-four hours to be certain of complete and even penetration of the formalin solution, and then they were placed upon the freezing table of the microtome, sectioned and carried through the various staining, dehydrating and clearing solutions as if they were a tissue. The particular method employed was one that I have used for about twelve years with great satisfaction, and which will be found described in detail in a short paper in the January, 1940, *American Journal of Clinical Pathology*, entitled, "A Rapid Method for Making Good Fixed Frozen Sections."

In this method the tissues are handled free and unattached through a minimum of solutions to secure good staining and clearing, and are finally mounted directly out of beechwood creosote. By this method the cells are not distorted, and hence a more normal histological picture is obtained, and the sections keep quite as well as paraffin or celloidin ones, if mounted in damar instead of balsam. The sections obtained in this case revealed the carcinoma cells forming irregular mucous-type gland acini. They were surrounded by the pus cells from the exudate, which had become firmly fixed about the tumor tissue. In all other cases that I have been able to find in the literature in which the histologic diagnosis was made from pleural sediment, the sediment was first embedded in paraffin, so I believe the case that I am reporting is unique in that the diagnosis was made from fixed frozen sections. And even though the photomicrographs prepared from the sections do not quite

do them justice, they demonstrate that these fixed frozen sections are at least the equal of paraffin sections prepared from similar material. In fact, I believe they are superior, as there is no shrinkage of the cells or other distortions such as frequently occur in the most expert paraffin embedding.

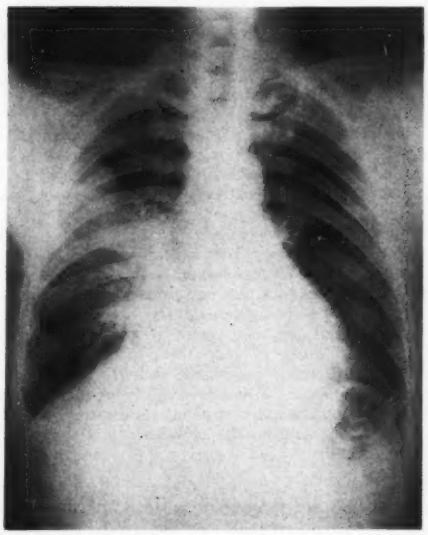

Fig. 1
Roentgenogram of right lung, showing hilus shadow due to bronchogenic carcinoma.

A few days after the diagnosis had been proven in the above manner, the patient complained of a sudden violent pain in the right chest, became dyspneic and died very promptly. At autopsy atelectasis of the bulk of the right lung was found, and this massive collapse was undoubtedly due to the perforation of the anterior visceral pleura by the hilar tumor, permitting communication between a branch of the right bronchus and the pleural cavity. The malignant growth had apparently originated in the mucous glands of this branch of the bronchus and infiltrated the lung tissue in an irregularly fan-shaped manner over quite an extensive area so that the lung in the hilar region was very firm and yellowish-white in color, in contrast to the purplish-red color of the collapsed lung adjoining it. When incised, the tumor tissue was found to be in part semi-necrotic, due to extensive secondary infection, and there was even a beginning pneumonic process in the lung tissue contiguous to the new growth. There still remained about 400 c. c. of blood tinged pleural fluid in the right chest cavity (in addition to the 1,200 c. c. previously aspirated). The right peribronchial lymph nodes as well as the mediastinal nodes were very greatly enlarged, due to metastases from the lung tumor. Although a careful search was made for other secondary growths, no other metastasis was found except for a

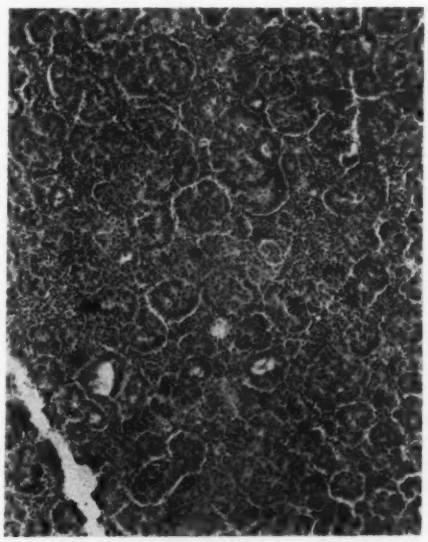

Fig. 2
Fixed frozen section of pleural fluid, showing adenocarcinoma, arising from mucous type glands of right bronchus (440 X).

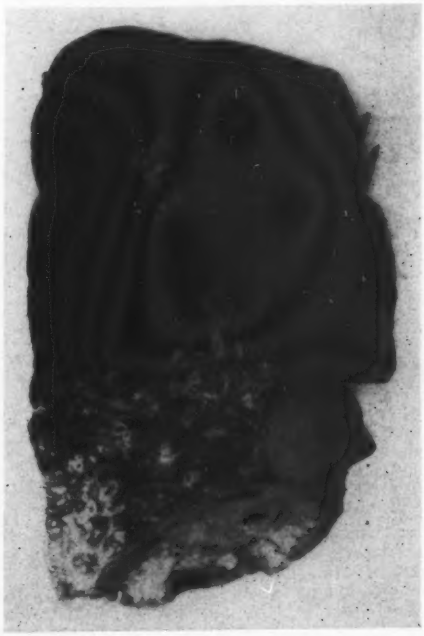

Fig. 3
Photograph of right lung, cut surface revealing infiltrating bronchogenic carcinoma.

very unusual one in a branch of the left coronary artery. Here the tumor cells had lodged as an embolus and were reproducing inside the blood vessel, the same type of glandular neoplasm found in the original tumor. It was indeed surprising that no metastases were found in any of the abdominal organs, particularly the liver, which latter is nearly always involved in such an advanced malignancy of the lung.

Fig. 4
Photomicrograph of bronchogenic carcinoma of right lung (440 X).

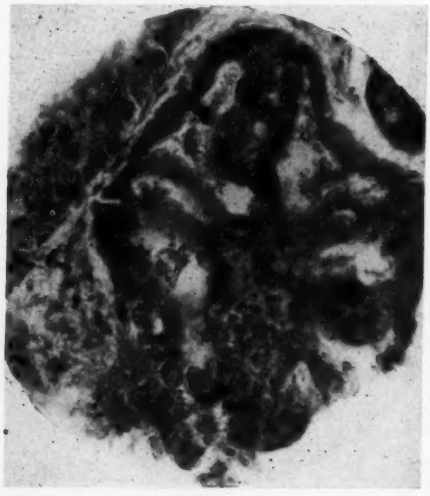

Fig. 5
Photomicrograph of same section as in *Fig. 4*, showing higher magnification of some of the neoplastic gland acini (950 X).

Microscopic sections of the primary lung tumor itself show quite a varied picture. In some areas the tumor cells are attempting to form gland acini, and the cells are more or less cylindrical, while in other regions the cells occur in solid alveolar masses and are more or less embryonic in type. There are some very large cells with large round or oval nuclei and prominent nucleoli (the one eyed cells of Broders). Mitotic figures and examples of irregular nuclear division are numerous. There are no areas which are suggestive of squamous cell origin. Many large sections of the tumor have become necrotic and this degenerating tissue is heavily infiltrated by polynuclear leukocytes. The contiguous lung tissue shows a pneumonic process, with the alveoli filled with purulent exudate. Further testimony, in addition, to the cytology above described, of the highly malignant nature of the tumor is its invasiveness, destroying all types of tissue encountered apparently with equal facility. It had eroded through the cartilage and the epithelial lining of a main bronchus; it had destroyed large areas of pulmonary tissue in the hilus region and adjoining areas; and it had eroded through the visceral pleura. Since a number of blood vessels were found in the primary lung tumor that had been invaded by the cells of the new growth, the metastasis in the coronary blood vessel already described must have been embolic.

There has been considerable confusion in the classification of the several varieties of primary carcinoma of the lung. The classification most generally adopted is one which embraces three varieties according to cell type: (1) squamous

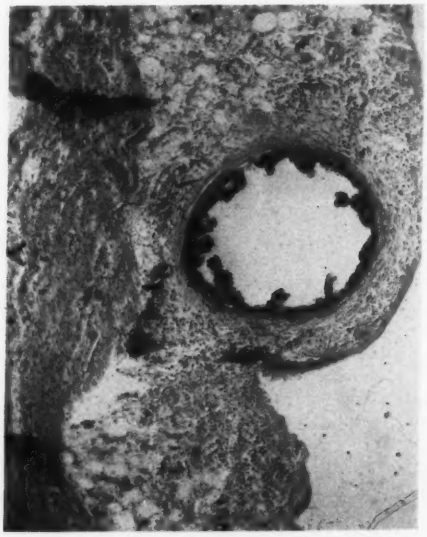

Fig. 6
Photomicrograph of metastasis in coronary artery branch from primary lung tumor (440 X).

cell carcinoma; (2) adenocarcinoma; and (3) mixed cell or pleomorphic cell carcinoma. Some refer to the adenocarcinoma type as cylindrical-cell carcinoma, but since these tumors composed of the so-called cylindrical cells are manifestly adenocarcinomas, I prefer to so designate them. More elaborate classifications of this group of tumors have been proposed by some, which would seem to be unnecessarily complicated and to serve no particularly useful purpose. A large majority of the cases reported thus far are the adenocarcinoma or cylindrical-cell type, and arise from the bronchial glands in the submucosa, and are, therefore, of the mucous gland type originally. Over 75 per cent of all cases belong to this class, according to some authorities. From 10 to 15 per cent of reported cases are of the squamous cell variety and arise from the bronchial mucous membrane. In this type the cells are arranged in solid masses of varying shape; prickle cells can be demonstrated and often a few epithelial "pearls." As one author has pointed out, it is necessary to find prickle cells before a tumor can be definitely classified as of squamous cell origin, and if a few epithelial pearls are also present, the diagnosis is even more certainly correct. Some have classified as squamous cell tumors those in which there were no distinct gland acini formed and in which the cells occurred in alveolar arrangement, but in which neither prickle cells nor pearly bodies could be made out. This would naturally raise the percentage of squamous cell tumors in any classification, but I agree with those who contend that certain definite criteria should be met before assigning a tumor to such classification. In the pleomorphic variety the cells vary greatly in size, shape and appearance so that in some cases the appearance of an oat cell or a round cell sarcoma is simulated. Indeed, some of these tumors have been erroneously diagnosed as sarcomas of these varieties. Such neoplasms are very embryonic in structure and hence exceedingly malignant.

Several successful operations have been reported in the literature since Graham performed the first total pneumonectomy for primary carcinoma of the lung, the patient being a fellow physician who was alive and comfortable, and apparently well as long as five years after the operation. Radical surgery appears to offer the only hope in carcinoma of the lung, and, of course, this is useless if widespread metastases have already occurred. Although some radiologists will disagree with this statement, most authorities are of the opinion that roentgenotherapy offers little either as to the prolongation of life or as a palliative measure. Grave as the prognosis undoubtedly always is in this serious condition, the fact that radical surgery has prolonged the life of even a few patients with bronchogenic carcinoma, is one more incentive to the utilization of every possible method of early diagnosis.

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DISCUSSION (*Abstract*)

Dr. Roy R. Kracke, Emory University, Ga.—The diagnosis of primary bronchogenic carcinoma can be made by the pathologist from a variety of specimens. In my own experience the specimen usually submitted is one removed by aspiration biopsy, less frequently one removed by bronchoscopic examination, and then least frequently a specimen of pleural fluid may be examined for the presence of carcinoma cells.

At the Winship Tumor Clinic at the Emory University Hospital, aspiration biopsy of lung tumors is a rather common procedure, and the material obtained is usually quite satisfactory for pathologic examination. Using the large gauge needle that has already been described by Dr. Venable, quite large pieces of tissue are obtained, hardened in formalin, and sectioned in the usual manner. I am quite convinced that the single factor most important in the success or failure in establishing the presence of carcinoma cells in this disease is the adequacy of the specimen submitted for examination. This is one reason that I favor aspiration biopsy as a method of choice for obtaining the diagnostic specimen, since the material is usually adequate, especially if obtained by a skillful operator with a wide experience in the method.

The modification of fixation and staining of pleural fluid that has been suggested by Dr. Venable no doubt is ingenious and yields satisfactory results. It does not necessarily follow, however, that such a method should be adopted by all pathologists, because it is well known that nearly every pathologist has his own methods of staining that are satisfactory for him. In the examination of such a specimen in my laboratory we would centrifuge the material into a tightly packed sediment and this then would be fixed in formalin and sectioned in the usual manner, without going through the process of doing a frozen section. Frozen sections are hardly necessary in this type of diagnosis, because there is usually no particular rush under such circumstances, particularly if tissue reports are rendered routinely 24 hours after reception of the tissue. Furthermore, since all pleural fluids should be studied for evidence of other diseases, it is quite possible with ordinary Wright's stain smears to establish the presence of bronchogenic carcinomatous cells.

Dr. Venable (closing).—I have not in this paper advocated fixed frozen sections of pleural fluid as a method

of choice in the diagnosis of bronchogenic carcinoma, but instead enumerated the various diagnostic methods in the order of their relative importance. I wish merely to stress the value of this method in certain cases. The stained frozen sections of fixed pleural sediment do look like fixed tissue, but that appearance is an artefact. There were no macroscopic bits of tissue in the pleural fluid. The pus also present packed about the minute particles of cancerous tissue to form what appears in the sections to be a stroma infiltrated by polynuclear leukocytes. Fixed frozen sections can be prepared from any sediment from which paraffin sections could be made. And I will leave you to judge whether you would have any difficulty in making a diagnosis of bronchogenic carcinoma from the sections that you have seen projected upon the screen.

ANKYLOSING SPONDYLARTHRITIS*

MARIE-STRUMPELL ARTHRITIS. ROENTGEN AND ORTHOPEDIC THERAPY

By LENOX D. BAKER, M.D.
Durham, North Carolina

Rhizomelic spondylosis, which is sometimes called Marie-Strumpell arthritis or Von Bechterew's disease, is a malady of the spine and root joints. Whether it is a type of rheumatoid arthritis or is an entity has not been determined and, like the other arthritides, it is without a known etiology or a curative therapy. The condition is more common than is indicated in the literature partly because of the various names under which it has been discussed, but probably more because of the frequency of mistaken diagnosis. Recent reports of excellent results obtained by roentgentherapy have created a new interest in this disease; have made early and correct diagnosis important; and have warranted a review of the subject and improvement in the orthopedic care of the patient if full benefit is to be obtained by combined orthopedic and roentgen ray treatment.

SIGNS AND SYMPTOMS

There are three common sites of onset: (a) the sacro-iliacs, (b) the lumbodorsal area, and (c) the cervicodorsal junction. When the sacro-iliacs are involved, the syndrome is frequently referred to as "lumbago" and is well described by the lay term "lame back." Early and definite diagnosis is difficult because of the slow and insidious onset of the symptoms and because of the lack of early roentgen ray changes. The patients are usually seen in the third decade, but in many instances close questioning will elicit a story of previous attacks. In sixteen cases of ankylosing spondylarthritis detected by Forestier he was able to prove by reinterpreting the roentgenograms taken two, four, or even eight years previously that sacro-iliac changes were already existent at that early stage, but had been overlooked by qualified roentgenologists. The most consistent early symptom is a vague morning backache, which frequently improves with mild exercise, but is aggravated by fatigue. The pain varies in its intensity and site, and there may be an associated sciatica. Back strains or sudden movements may initiate an exacerbation of symptoms with increased muscle spasm and stiffness, which is mistaken for a lumbosacral strain or other mechanical defects. The muscle spasm may become chronic and serve as a forerunner of a flexion deformity of the spine. Occasionally when the lumbodorsal area is involved, there is some radicular pain which may mimic intercostal neuralgia, and frequently there is general malaise associated with a gradual decline of the patient's health. Attacks of wry neck and stiffness of the shoulders and hips usually come on late in the course of the disease, but sometimes these are seen as early symptoms. Fist percussion over the spine may elicit generalized tenderness, but as a rule such tenderness is confined to a definite region, which may vary in locality in the same patient at different examinations. As the process advances over a period of years, stiffness becomes more marked, the patient becomes more guarded in his movements, and, if deformities are allowed to develop, the gait becomes awkward. As the spine stiffens, there is also an involvement of the costovertebral joints and a diminution of the vital capacity.

While the disease is active, the sedimentation rate is elevated; other laboratory findings are usually within normal limits. During the early inflammatory period of the disease, roentgen ray films may be essentially negative, but as a rule decalcification and mottled trabeculation can be demonstrated in the subchondral bone adjacent to the sacro-iliac joints with haziness and apparent widening of the joint spaces. Associated with these changes are picnotic areas of increased density. Usually the changes are bilateral in nature, but they may be confined to one side. In a large percentage of patients these sacro-iliac findings are present long before any

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*Read in Section on Bone and Joint Surgery, Southern Medical Association, Thirty-Sixth Annual Meeting, Richmond, Virginia, November 10-12, 1942.

*From the Orthopaedic Division, Department of Surgery, Duke University School of Medicine, Durham, North Carolina.

*Roentgentherapy given under the supervision of Dr. Robert J. Reeves.

demonstrable lesions appear in the spine. Later there is an osteosclerosis of the subchondral area with destruction of the articular cartilage and trabeculation across the joint space. Early x-rays of the spine may show some mottling of the intervertebral spaces. Osteophytic bridging of the vertebrae is a late change. Forty-five degree oblique films of the articular facets may show haziness and narrowing of the joints. Forestier made a most valuable observation in pointing out the difference between the non-ankylosing vertebral ossification (osteophytes) and the ankylosing ossifications, which he calls syndesmophytes. The latter term means a growth from the ligament in opposition to osteophytes, which means a growth from the bone. Forestier says:

"Syndesmophytes can be easily distinguished from the osteophytes from the beginning since the former appear as a woolly shadow in the intervertebral space which, within a few months, is transformed into a rather clearcut, dense, linear calcification without a cortex, having the appearance of a thin or a thick comma added to the contour of the vertebral body. The osteophytes, on the contrary, have a much thicker base, are covered with a cortex which comes from that of the vertebral body, and a structure of cancellous bone like the vertebral body itself."

TREATMENT

Swaim's report of the end results of one hundred and six cases of ankylosing spondylitis is a most complete and detailed outline of therapy, which points out that muscle spasm and deformity exist for some years before actual ossification of the ligaments takes place, and emphasizes the importance of early treatment. Established orthopedic measures consist of bed rest on a Bradford frame for gradual hyperextension of the spine; physical therapy to obtain muscle relaxation; corrective exercise to straighten the spine further and to increase chest expansion, followed by supporting braces. Following the report of Smyth, Freyberg, and Lampe on the result of roentgen ray therapy for rheumatoid arthritis of the spine, our roentgenology department cooperated in establishing a regime for combining orthopedic and roentgen therapy in the treatment of Marie-Strumpell patients. The patients are given a complete work-up, and a search is made for foci of infection, which, if found, are removed. Complete laboratory studies which include sedimentation rate and Weldman reactions, are carried out and calcium, phosphorus, and phosphatase determinations are made. Roentgenograms are secured and photographs are made to show the range of motion in the spine. The patient's height and measurements of the chest and chest expansion are recorded. Roentgentherapy is given over the entire spine or the involved area, depending on the clinical findings. Two hundred kilovolts are used in treating areas of about 5 cm. x 15 cm. One hundred and fifty r. are given over one or more areas daily for three to five treatments; if necessary, the dosage is repeated after three to six weeks. The addition of roentgen ray therapy gives early alleviation of pain with relief of muscle spasm and allows rapid correction of deformities and more vigorous attempts at restoration of muscle balance.

If nausea develops during the treatment, intravenous fluids are used, the dosage of roentgen ray is reduced, and the exposures are spaced farther apart. When needed, blood transfusions are given to build up the patient's general condition and counteract any effect the x-ray therapy may have on the blood vascular system.

On admission the patient is placed on a Gatch bed with a Latex mattress and a fracture board. The fracture board is so hinged as to conform to the adjustable bed, and hyperextension of the spine is obtained by placing the patient's

Fig. 1

A Gatch bed with a Latex mattress and a fracture board. The fracture board is hinged to conform to the adjustable bed, and hyperextension of the spine is obtained by placing the patient's head toward the foot of the bed.

head toward the foot of the bed as shown in *Fig. 1.* If necessary to correct flexion deformities of the hips, traction is applied to the lower extremities. In applying the traction so that it may be removed for physical therapy we use the method as described by Barnard, but substitute piano felt for the sponge rubber because of the present shortage of the latter. This form of traction has been found to be most satisfactory. The patient is taken to physical therapy twice a day for heat, massage, and corrective exercises, especial attention being given to securing relaxation of the abdominal muscles. The exercises are directed at correcting the flexion deformities and are carried out on an apparatus as shown in *Fig. 2.* The apparatus was designed to prevent hyperextension of the lumbosacral area and to aid in the correction of the dorsal curve and the development of the thoracic bundles of the sacrospinalis muscles. To accomplish this purpose, the patient fixes his pelvis with his gluteal and abdominal muscles, and the body strap is put on sufficiently tight to act as a fulcrum and to allow the greatest portion of the hyperextension forces to take place in the region where the strap or belt is fitted, thus aiding in the hyperextension of the dorsal spine and in increasing the excursion of the thoracic movement. When final correction of the deformities is obtained, some form of support is necessary to prevent recurrence and to prevent the trauma of use and continued muscle spasm, which act to keep the disease active and to keep the involved tissues in an inflamed condition during convalescence. Such immobilization which should be complete is usually obtained by plaster of paris, celluloid, or leather body jackets, but such supports are heavy, are not adjustable, and in temperate regions are uncomfortable. It seemed desirable to design a brace which would maintain and if possible give further correction to control rotation and at the same time be comfortable both as to fit and as to body surface temperature. In trying to meet these standards the brace as pictured in *Fig. 3* was developed. It was made of five-eighths inch orthopedic steel, and it is sufficiently deep for the side bars to lie in the mid-axillary line in order to fix the pelvis and thorax as a unit to prevent rotation of the spine. The brace is held in place by webbing straps, and a heavy elastic strap is placed at or just below the height of the curve to be corrected. The elastic strap is fitted sufficiently tight to hold the brace snugly against the patient's body and at the same time loose enough not to give too great a pressure across the back. The strap which holds the abdominal pad may be made of webbing, but in some instances heavy elastic is used. Although the elastic allows more abdominal movement, it discourages low abdominal expansion with respiration. If to encourage thoracic breathing further fixation of the abdomen is desired, the abdominal pad can be made larger or an apron can be attached to the brace in place of the pad. However, it is felt that the pad is more satisfactory, as it does not cause the abdominal distress frequently seen with tightly fitted garments. The two crossbars are fitted in the pectoral and inguinal regions so as not to interfere with movement of the

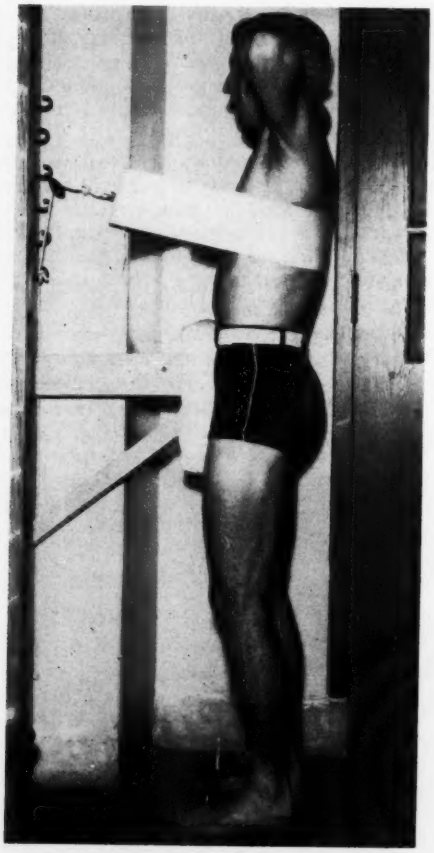

Fig. 2

Exercise apparatus designed to prevent hyperextension of the lumbosacral area and to aid in the correction of the dorsal curve and the development of the thoracic bundles of the sacrospinal muscle.

shoulders and hips, and the pubic and manubrial pads are freely hinged to allow for adjustments with respiratory movements.

Satisfactory correction of deformities in the Marie-Strumpell group of patients frequently requires many weeks of hospitalization with the patient recumbent on a Bradford frame. Since the introduction of roentgentherapy the average time for correction with the combined therapies is now ten days and hospital stay is two weeks, but, with further experience, it appears that a longer period hospitalization may be advisable for continued physical therapy and further supervised muscle training. In some instances six to eight weeks following the initial treatment, a second period of hospitalization of ten days to two weeks has been found to be of benefit and has seemed to stimulate the patients to more enthusiastic efforts, which are necessary in this type of chronic patient. Thus far the patients' general health has improved, and with those patients who have had check-up laboratory studies the sedimentation rate has been lowered. With the combined therapies, correction of the deformity has been more easily obtained and there has been little tendency for recurrence. In the case of those patients where there has been some recurrence the pain has subsided satisfactorily with repeated roentgentherapy; short periods of bed rest, and the application of local heat.

This disease is obstinate and difficult. Too short a time has elapsed to determine whether the roentgentherapy is only analgesic or whether it has a deterrent effect on the disease and will serve to prevent further ossification of the ligamentous structures of the spine. Thus far the results have been most satisfactory: in several patients who had no pain the roentgentherapy has been given in the presence of rather advanced calcification and marked stiffness, and there has been a surprising improvement in the range of motion. The patients, when possible, are to be followed over a period of years before

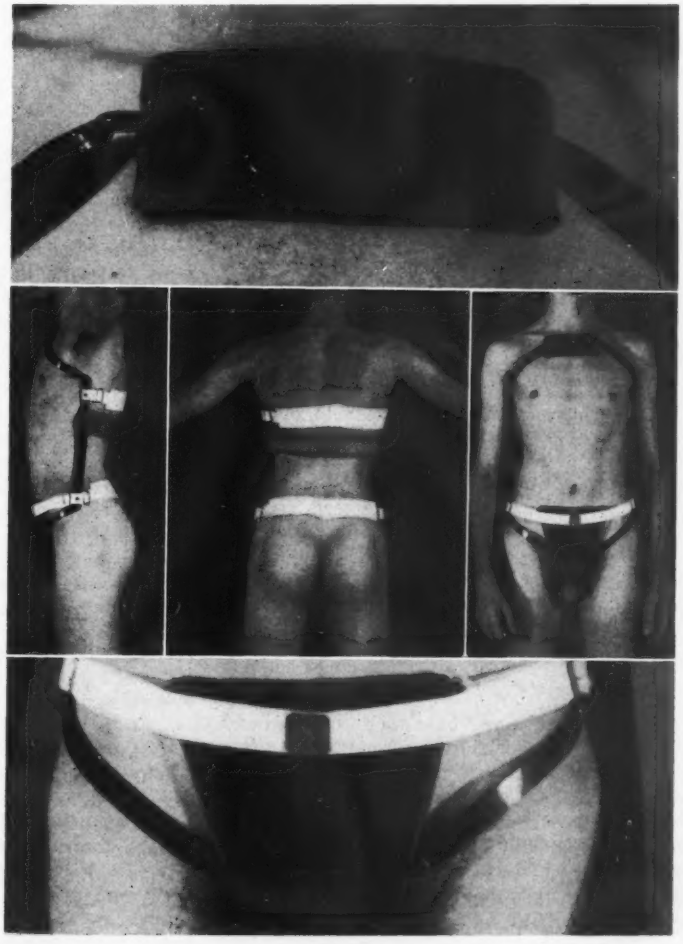

Fig. 3

A three-point hyperextension brace with heavy elastic band across dorsal area of the spine to straighten the spine further. Side bars are placed in or just posterior to the mid-axillary lines in order to fix the pelvis and thorax as a unit to prevent rotation of the spine. The manubrial and the pubic pads are freely hinged to allow respiratory movements. The crossbars are fitted in the pectoral and inguinal regions so as not to interfere with movements of the extremities.

final conclusions can be reached. The fact that the sedimentation rate has been decreased by the therapy gives us hope that perhaps the rays have some deterrent effect; certainly they have been of a great help as a palliative treatment.

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THE PRACTICAL SOLUTION OF SOME COMMON ANORECTAL PROBLEMS*

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During an emergency we are compelled to assume or resume, purposely or inadvertently, tasks which previously had been delegated to others. Doubtless, the general practitioner will assume the task of solution of many of the diagnostic and surgical problems which in the past were referred to the proctologist. It will be my purpose to try to prove that these problems can be interesting and actually stimulating. They are so diverse that they provide tests for the practical application of special knowledge, ingenuity and dexterity. Moreover, the gratitude of the patient who has been relieved of anorectal discomfort or dysfunction adds measurably to that satisfaction which derives from the realization that sincere efforts have been appreciated.

GENERAL CONSIDERATIONS

To provide a common base upon which to build a structure of understanding would necessitate a considerable exchange of ideas. Since this is patently impossible in so short a time as that allotted, it seems advisable to state only a few facts of undebatable importance which it will be assumed are acceptable. It will be assumed that patients who have internal and external hemorrhoidal tissue, anal fissure or fistula in ano, if not invariably, then frequently, require surgical treatment to accomplish a satisfactory cure. These surgical efforts are not often life saving; therefore, in the course of such procedures everything should be done to avoid unnecessary risks and complications. All such patients should have the benefits of an intelligently accomplished sigmoidoscopic examination and a thorough physical examination prior to the operation.

The general practitioner should know the anatomy of the anus and adjacent structures, but it is of equal importance that he also understand the normal manner in which these structures function. He must observe the individual variations which occur in the anorectal structures, even in the absence of disease, and must be prepared to grasp any advantage which these variations might provide. The sort of imagination which will permit the surgeon to visualize the result which he intends to accomplish will aid him in planning the operation. During the operation the surgeon should be prepared to alter his plans immediately if an opportunity which is advantageous is discovered, or if unusual complications or difficulties are encountered.

It is necessary to admit that incomplete, insufficient or misdirected surgical procedures too frequently provide relief which, temporarily, seems satisfactory. What physician has not encountered patients who, having undergone several operations for anorectal disease, find that after transient relief they still have their original disability and perhaps more? Therefore, I shall concern myself herein with procedures which provide for the thorough removal or exposure of pathologic tissue and realignment of remaining tissue to attain the normal relationships of the skin and mucous membrane and also normal, comfortable function. It hardly seems advisable to risk a satisfactory result by the substitution of timidity and simplicity for thoroughness and understanding.

PREOPERATIVE CARE

The patient who is to undergo anorectal surgery should omit one meal or two prior to the operation, and he should enter the hospital early enough to permit unhurried preparation. The bowel may be prepared by the administration of several enemas of soap solution "until the returns are clear." The patient usually will require some preoperative medication. At the clinic we administer 1½ grain (0.1 gram) of pentobarbital sodium two hours before the patient is taken to the operating room. Just before he is taken to the operating room we ad-

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*From the Section on Proctology, Mayo Clinic, Rochester, Minnesota.

minister hypodermically 1/6 or 1/4 grain (0.01 or 0.016 gram) of morphine sulfate. The patient is placed upon the operating table in the prone (ventral) position. Sacral block anesthesia is then accomplished. The patient's hips are elevated 6 or 8 inches (15 or 20 cm.) above level of the rest of his body by means of a padded kidney rest. After anesthesia has been produced the skin of the sacrococcygeal, gluteal, perianal and the perineal regions is cleansed and an antiseptic solution such as tincture of biacetoxymercuri-4-intro-2-cresol (metaphen) is applied. This is a plan which can be altered freely and it is outlined herein merely to insure clearer understanding.

ANESTHESIA

The ideal anesthesia is one which is ample, of sufficient duration, causes no distortion of the parts to be operated upon, provides relaxation, causes a minimum of nausea and vomiting and achieves all these objectives at little or no risk to the patient. Sacral block anesthesia is very satisfactory. Caudal anesthesia, low spinal anesthesia, perianal infiltration anesthesia, inhalation anesthesia and intravenous anesthesia also are employed.

"STEP-BY-STEP" CONCEPT VERSUS CONCEPT OF PLASTIC SURGERY

Numerous methods for the surgical removal of hemorrhoids, fissures and fistulas have been described. Too frequently, however, these methods describe treatment used in cases in which the lesions are not complicated, whereas in actual practice the frequency with which these lesions coexist is surprising. A "step-by-step" method of removal of hemorrhoids proves to be confusing if not impracticable when it is found that a fissure or several enlarged papillae also are present. A comparatively simple fistula may provide a puzzling task when it is complicated by internal and external hemorrhoidal tissue; again, examination may reveal internal and external hemorrhoidal tissue complicated by scarring resulting from previous treatment, and then the simple "step-by-step" method may prove useless.

How then are we to solve these surgical problems? Our problems are essentially problems in plastic surgery which at times are simplified and at other times are made more difficult by the anatomic and physiologic peculiarities of this part of the body. All anorectal incisions must be designed so that the resulting wounds will provide for ample drainage and also insure that healing of that portion of the wound proximal to the anal verge will occur before healing of the distal or perianal portion. All tissue which it is necessary to remove for accomplishment of our purpose should be excised, but we should never sacrifice any tissue unnecessarily. All anorectal surgery should be accomplished with the least possible injury to tissues, and the operation should cause only minimal distortion of normal tissue relationships and contours. Sutures should be placed so that they will maintain the desired position of the anorectal tissues and insure hemostasis, but they should not be tied so tightly that they will cause sloughing of the involved tissues. Properly placed, these sutures need add little to the patient's postoperative discomfort.

IMPORTANCE OF KNOWLEDGE OF ANATOMIC ASPECTS

Knowledge of the anatomy and function of the anal tissues is important because the application of this knowledge permits the surgeon to solve these problems individually and yet to exercise his skill within the limitations of his physical equipment and dexterity. The ability to recognize the dentate margin or mucocutaneous junction is important because re-establishment of this line is one of the objects of anorectal surgical procedures. The proximal fibers of the external sphincter muscle form a consistent, practical landmark for the level of the dentate margin. Exposure of the fibers of the external anal sphincter muscle provides a guide which will assure thorough removal of external hemorrhoidal tissue. If, during an operation, there is any doubt concerning the situation of the external sphincter muscle, bidigital examination will promptly eliminate the uncertainties. The surgeon should realize that the mucosa and skin in this region are unusually movable, and also that the perianal skin is freely movable for a distance of from 2 to 3 cm. (about 3/4 to 1 1/4 inch). Usually, external hemorrhoidal tissue must be removed to the lateral limits of this movable skin.

Before any anorectal surgical procedure is begun, after the anus is relaxed, it is well to palpate the anal and perianal tissues bidigitally. This can be accomplished by insertion of the left index finger through the anus and palpation of the tissue thus engaged with the thumb of the same hand or the index finger of the other hand. This will often reveal a pathologic process masked by normal muscular tone or spasm.

DILATATION

Some authors have advocated dilatation or divulsion of the anus as the first step in almost all anorectal operations. This practice doubtless results from habits of surgeons which were formed when the use of inhalation anesthesia was mandatory. At present, because anesthesia can be obtained which will produce relaxation without added risk, there is no need for dilatation unless definite anal contraction is present. Digital dilatation sufficient to permit the insertion of two fingers into the anus simultaneously is ample. Dilatation should not be considered as being innocuous, since it increases the amount of edema, extravasation of blood and active bleeding.

POSTANAL FISSURE

An anal fissure is an ulcer which appears in the posterior or anterior midline and it usually requires surgical treatment. An enlarged papilla and an external tag of tissue frequently are associated with an anal fissure. With surprising frequency, however, an anal fissure also is associated with internal and external hemorrhoidal tissue or a small subcutaneous abscess or even a draining sinus. If we have in mind an operation which will provide only for the excision of an uncomplicated fissure, the attempt to cure a fissure and a coexisting anorectal pathologic process by such an operation will make the task necessarily difficult. If we recall, however, that basically we propose to remove the pathologic tissue or to alter it so that we can provide for the restoration of the normal relationships of skin and mucous membrane at the level of the dentate margin, then our problem can be solved by application of the principles of plastic surgery which will encourage originality.

A simple method of removal of a typical posterior anal fissure is to dilate the anus if necessary, then to place a double stitch of plain number 1 catgut in the posterior midline about 1 cm. (½ inch) above the level of the dentate margin (*Fig. 1a*), by the use of a number 3 Mayo taper-point needle. The suture should be tied so that two ends of equal length remain, 10 to 12 inches (25 to 30 cm.) long. This suture, so placed, provides a means of retracting the mucosa as well as a landmark which will make the midline apparent regardless of the extent of bleeding which may occur. A gauze sponge (3 by 9 inches, or about 8 by 23 cm.), should be placed in the rectum and a somewhat elliptical excision of the mucosa and skin distal to the suture, exposing the fibers of the external sphincter muscle, should be accomplished. The

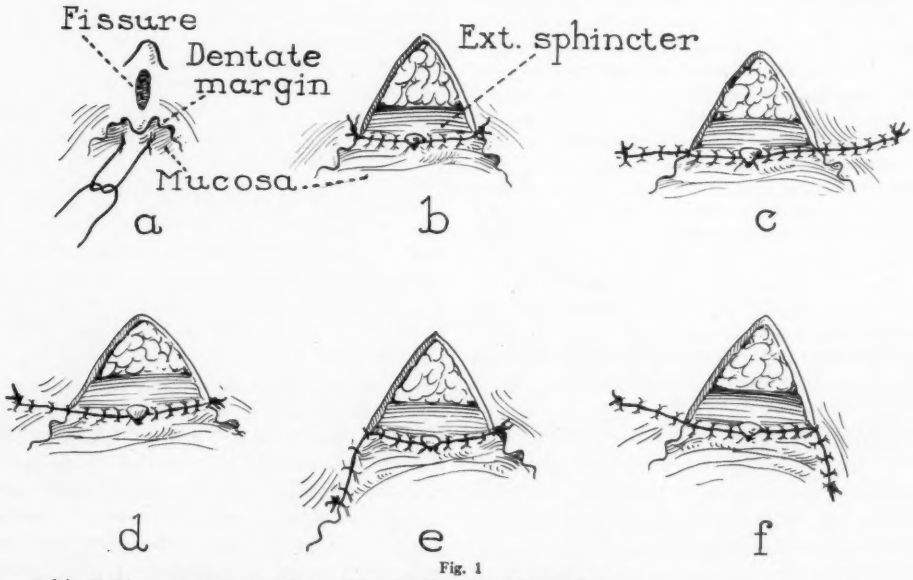

Fig. 1

a and b: Excision of posterior anal fissure with enlarged papilla and external tag.
c, d, e and f: The resultant wound after excision of internal and external hemorrhoidal tissue in several locations.

mucosa should be drawn distally and sutured transversely, the long ends of the suture being used, and the mucosal edge should be sutured to the proximal fibers of the external sphincter muscle. The suturing is accomplished by holding the knot which was first tied in the midline at the proper level and then suturing laterally with a continuous half Lembert's locked suture (*Fig. 1b*). If an enlarged papilla and an external tag are present, they can be removed without alteration of the technic outlined. If, however, there is an abscess or a subcutaneous fistula, then the base of either of these lesions should be exposed and made a part of the base of the entire wound. It is not necessary, nor is it advisable, to incise any of the sphincter fibers unless they project transversely from the base of the wound, thus, by dam-like action, preventing drainage. Only those fibers which project above the level of the base of the wound need be incised. The most common operative error is failure to remove enough skin distally.

Any hemorrhoidal tissue present can be observed by the insertion of three (3 by 9 inch) gauze sponges into the patient's rectum through a large Hirschman anoscope and then slow withdrawal of them through the anus. If hemorrhoidal tissue is found to be associated with the fissure, how can we alter our technic? If the fissure is small and otherwise uncomplicated, it can be removed with the hemorrhoidal tissue in the right posterior quadrant. If there is hemorrhoidal tissue on one side or both sides of the fissure, this tissue can be included in the excision by lateral extension of the excision of mucosa and skin. This excision should be sufficiently deep to provide for the exposure of the fibers of the external sphincter muscle. When excision has been completed, a wound with a symmetric central portion and one or two symmetric or asymmetric lateral portions results. The lateral portions can be so planned that margins of these portions of the wound can be approximated and the normal relationship of skin and mucous membrane established laterally. The central portion, if properly planned, will insure ample drainage. It is well to exercise sufficient care so that if primary union does not occur laterally, then minimal formation of tags and anal deformity will result (*Fig. 1c, d, e* and *f*).

INTERNAL AND EXTERNAL HEMORRHOIDAL TISSUE

Almost any therapeutic effort which will produce an inflammatory process and some scarring will relieve temporarily the symptoms produced by hemorrhoidal tissue. For this reason there is a tendency to misinterpret results by substituting "temporary relief" for "cure" in calculating the efficacy of a particular method. This is mentioned herein because the suggestions which follow are directed toward thorough removal of hemorrhoidal tissue. It is interesting to observe that those surgeons who concern themselves with the care of patients having anorectal diseases usually employ more radical measures than do those surgeons who venture to accomplish only an occasional anorectal operation. Solution of the surgical problems associated with removal of internal and external hemorrhoidal tissue can be interesting if such problems are approached reasonably.

In the presence of extensive thrombosis in external hemorrhoidal tissue, large edematous internal and external hemorrhoidal tissue masses, protruding internal hemorrhoidal tissue which has become strangulated and may slough, acute abscesses, ulcerative colitis of any etiology or regional ileitis, it is best to defer surgical treatment until the condition present has subsided or is cured.

It is not practicable to try to plan the exact operative procedure until anesthesia has been accomplished and the patient's anus is relaxed. The insertion of a large-size Hirschman anoscope and the withdrawal of the obturator will permit inspection of the rectum and removal of feces or fluid which may be present. A 3 by 9 inch gauze sponge then should be placed in the rectum to prevent any blood from accumulating in the bowel above the level from which it can be removed readily. The insertion of three 3 by 9 inch gauze sponges through the anoscope so that a portion of the sponges projects from the anus when the anoscope is withdrawn provides a simple method for distending all the hemorrhoidal tissue. When the sponges are slowly withdrawn, the hemorrhoidal tissue becomes distended and the operation can be planned with the assurance that all the hemorrhoidal tissue can be removed. Ordinarily, it is expeditious to remove the hemorrhoidal tissue in the right posterior quadrant first; then that on the left side, and lastly the hemorrhoidal tissue situated anteriorly. The word "hemorrhoid" has been avoided in this paper purposely because, although in some patients the masses will occur as isolated tumors, it will be noted that more frequently the involvement is diffuse and extremely variable in extent, distribution and in the relative proportion of internal and external hemorrhoidal tissue.

In the removal of hemorrhoidal tissue, ex-

cision should extend from a point beyond the lateral limits of the external hemorrhoidal tissue (that portion covered with skin) to a point above the proximal limit of the internal hemorrhoidal tissue (that portion covered with mucous membrane). The depth of excision should be determined by the exposure of the fibers of the external sphincter muscle. Exposure of these fibers will insure removal of all external hemorrhoidal tissue. By the judicious use of sutures and clamps the limits of the tissue to be removed can be outlined, satisfactory retraction provided and necessary manipulation afforded. It is best to avoid placing a clamp on tissue that will not or may not be removed because of the undesirable reaction which will result, such as, not infrequently, unnecessary sloughing of the tissue.

If the hemorrhoidal mass is comparatively small, it can be removed by the placing of one clamp (6¼-inch Ochsner clamp) in the mucosa at the upper limit of the internal hemorrhoidal tissue, another clamp in the skin just beyond the external hemorrhoidal tissue and, just medially to this clamp, another clamp. With a plain number 1 catgut suture and a number 3 Mayo taper-point curved needle, a double suture is placed just above the proximal clamp (*Fig. 2a*). This suture is tied in such a way as to provide one short end about 3 inches (8 cm.) long and one long end 12 to 18 inches (30 to 45 cm.) long. Dissection should begin medially between the suture and the clamp, or laterally between the two clamps, so that the hemorrhoidal tissue with the overlying skin and mucosa is dissected away to expose the fibers of the external sphincter muscle. Then, by means of the suture, the mucosa is retracted to the level of the proximal fibers of the external sphincter muscle, and a half Lembert's suture is placed posteriorly, first through the mucosa; then through the muscle fibers. This suture is locked and suturing is continued by the placing of a simple suture through the mucosa above the retracting suture first placed. Suturing then continues through the muscle and is locked again. The half Lembert's locked suture is repeated anterior to the last suture and is tied. If the masses of hemorrhoidal tissue are comparatively small, this process can be repeated in each involved area. This procedure can be modified readily, if desired, by the use of an additional clamp in place of the suture;* then, after dissection has been completed, a continuous, locked half Lembert's suture can be employed: it should begin posteriorly at the level of the dentate margin and continue so as to retract the mucosal edge and fix it at the level of the proximal fibers of the external sphincter muscle (*Fig. 2b*). The technic can be modified additionally by following that suggested herein (under the section "postanal fissure") for the removal of posterior anal fissures, in which the two long suture ends are employed (*Fig. 2c*). These procedures provide for the thorough removal of the hemorrhoidal tissue without causing operative constriction of the anal lumen.

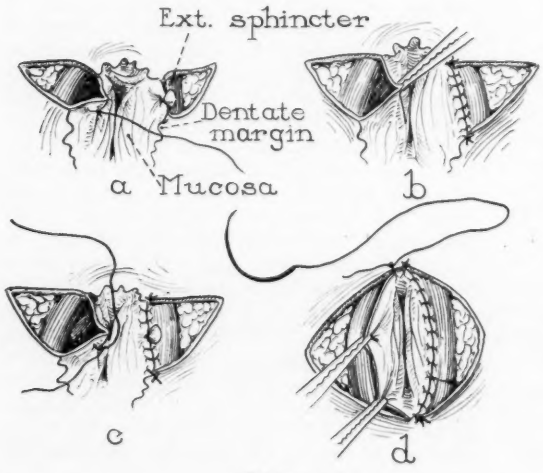

Fig. 2

a, b, c, and d: Various steps in the excision of internal and external hemorrhoidal tissue. Completed wound is seen at the right.

It may be necessary to remove the skin and mucosa with the underlying hemorrhoidal tissue from one whole side, frequently the left. If carefully accomplished, this need not cause undue worry. By the placing of a suture in the posterior midline and several clamps as landmarks above the level of the internal hemorrhoidal tissue and several more on the external hemorrhoidal tissue to facilitate manipulation of the tissue to be removed, an additional clamp or two clamps lateral to the external hemorrhoidal tissue for retraction, dissection can be accomplished as suggested above. It should extend from the posterior midline to the anterior midline and the resulting wound edge in the mucosa should be drawn distally by the clamps placed in the mucosa as landmarks, and sutured to the proximal fibers of the external spincter muscle by means of a continuous locked suture. This tech-

nic has been termed "modified amputative" because such a large portion of the anal circumference is removed at one time. If necessary, the procedure can be repeated on the other side.

It is valuable to notice that the wounds which result from the removal of internal and external hemorrhoidal tissue are diamond, oval and triangular in shape (*Fig. 3*), and that withdrawal of the mucosa to suture it circumferentially may alter the shape of the primary wound. This alteration produces a figure which has one presumably straight side at the level of the dentate margin and two other sides, straight or curved, extending laterally to a point beyond the lateral limit of the external hemorrhoidal tissue.

The degree of hemostasis which is accomplished by careful suturing at the mucosal sphincteric junction is so satisfactory that often no other hemostatic sutures are required. All arterial bleeding points should be sutured. Those parts of the skin and the mucous membrane which were traumatized by the application of clamps should be removed if possible. It is also advantageous to remove all overhanging edges of skin, since they will tend to form skin tags. The formation of skin tags is not always avoidable, but care in the provision of ample drainage and avoidance of unnecessary injury will aid materially in the prevention of this undesirable complication.

FISTULA IN ANO

There can be no doubt that surgical treatment is required for cure of a fistula in ano. This interesting lesion, which originates in the infection of an anal crypt, is completed when the resulting abscess ruptures spontaneously or is incised. The point of origin, which usually is single, should be called the "primary opening," and the point of drainage should be called the "secondary opening." But there may be more than one secondary opening, and these openings may occur above or below the level of the dentate margin.

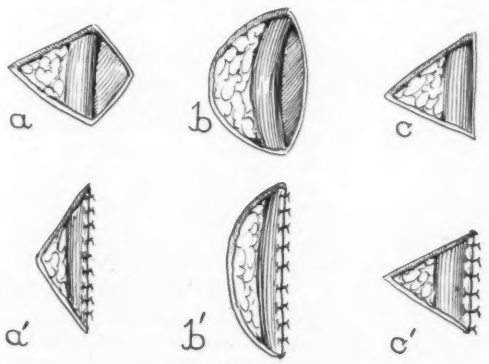

Fig. 3

a, b and c: Various types of wounds which usually result from excision of internal and external hemorrhoidal tissue.

a', b' and c': The same wounds after suturing.

If a patient is observed who has an acute abscess in the anorectal region, it usually is advisable to incise the abscess as soon as there is fluctuation and then wait for the acute inflammatory process to subside, after which fistulectomy can be performed. Incision often can be carried out without anesthesia, but intravenous pentothal anesthesia or local infiltration anesthesia can be employed. The incision should be ample and situated as close to the anal verge and the point of origin of the fistula as possible. It should be remembered that an abscess may drain spontaneously through the primary opening without actually forming a fistula. This obscure type of abscess also should be treated surgically, by completion of the fistula and by proceeding as if the original lesion had been a complete fistula.

To cure a fistula it is necessary to exteriorize the tract in its entirety. Bidigital examination, when the patient's anus is relaxed, frequently will assist in disclosing the location of the primary opening and also any obscure tracts, if such are present. If possible, the primary opening should be located and the incision, started at this point, should be continued to the secondary opening. The edges of the resulting wound should be removed to insure free drainage. It is best to disclose first the largest fistula tract and then the smaller ones. A bivalve operating anoscope often will provide satisfactory exposure of the primary opening and the anal portion of the wound.

If a complete or an incomplete internal fistula is present, a probe may be inserted into the cavity or tract and the tissue overlying the probe may be incised. A continuous locked suture placed around the edges of the resulting wound will provide hemostasis and also will permit ample drainage, because it will retract the margins of the wound away from the central portion of the wound. In such a wound as this, added care should be exerted to make certain that there is not a projecting edge at the level of the dentate margin. If such a projection is present, it should be incised, as a fissure wound would be, to prevent hindrance to free drainage.

This is an extremely brief discussion of the basic surgical considerations of fistula in ano.

It has been included herein to avoid any misunderstanding which might arise because application of the plastic surgical procedures I have mentioned is based on these basic considerations.

In the presence of both a fistula in ano and internal and external hemorrhoidal tissue, it is best to accomplish fistulectomy (*Fig. 4a, b, c* and *d*) first and then to adapt the method of excision of the hemorrhoidal tissue to the resulting fistula wound. Primarily, all hemorrhoidal tissue which will prolapse or become engaged in the fistula wound should be removed since if it is permitted to remain intact it will prolong healing and increase discomfort. Hemorrhoidal tissue frequently can be removed along with tissue which is removed, to provide free drainage (*Fig. 4b*). Then, with the surgeon taking advantage of the mobility of the skin at the anal margin, the resulting margins of the wound in the skin can be drawn from either side toward the base of the fistula tract or tracts, and sutured with a continuous locked suture or an interrupted suture. This will produce a wound which will be no larger than would have been the case if the hemorrhoidal tissue had not been present.

In removal of the margins of wounds it is advantageous to avoid unnecessary irregularities and projections of skin which will occur unless care is exercised. The most desirable wound (*Fig. 4a*) is one the two sides of which are equidistant from an imaginary line drawn through the center of the base of the tract; such a wound is widest close to the anus and tapers laterally. It is often possible to begin at the dentate margins and to suture each of the margins of the wound by means of a continuous locked suture or an interrupted suture, in such a way as to elevate that portion of the tract which forms the base of the wound (*Fig. 4c*). To accomplish this, a plain number 1 catgut suture thread on a number 3 curved Murphy needle with a trochar point is employed; it is inserted through the skin about 0.5 cm. (about ¼-inch) from the margin of the wound and is permitted to project through the subcutaneous fat. Then, by rotation of the needle, the subcutaneous fat should be retracted and the needle manipulated so as to pierce the lateral margin of the wall of the incised tract. The suture is then locked or tied and the procedure is continued to the extremity of the wound. This procedure, while providing hemostasis, also often saves a portion of the time required for healing, and it avoids some degree of deformity.

An enlarged papilla often is closely related to the primary opening of a fistula, and it can be removed without hesitation. Excision in such a case can be planned so that it will cause little, if any, increase in the amount of wound surface. Frequently, as in the case of incision through the primary opening, the mucosal edge of the wound will retract, but this deformity can be remedied promptly by drawing the mucosal margin distally and suturing it circumferentially to the proximal fibers of the external sphincter muscle (*Fig. 4d*).

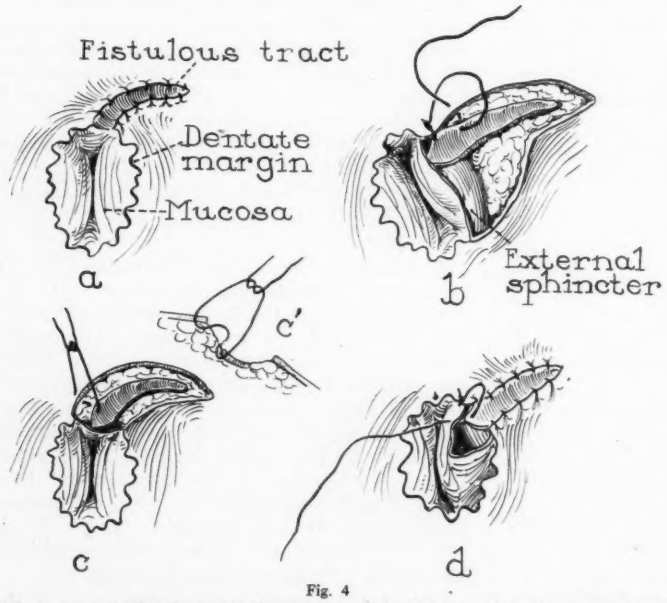

Fig. 4

a, b, c, c' and d: Wounds resulting from excision of fistula in ano. A fistulous tract is seen in a, and a denuded wound surface from which hemorrhoidal tissue has been removed is seen in b.

POSTOPERATIVE TREATMENT

All patients who undergo anorectal surgery are entitled to conscientious, intelligent postoperative care. It must be assumed that these wounds are infected, and therefore it is advisable

that they be irrigated with mild antiseptic solutions, especially after evacuation has occurred. Hot wet packs should be applied for from four to eight hours daily. Most frequently it will prove valuable to adjust the patient's diet so that normal, firm stools will result, to prevent postoperative contraction of the anus. In some cases, after extensive fistulectomy, it is advisable to prescribe a low residue or a nonresidue diet, but such variations in dietary regime will depend on the surgeon's judgment. It seems helpful to get the patient up as soon as it is practicable. The dressings should be as small as possible; they should be applied gently and the wound should be packed only when such a measure can be justified by unusual circumstances. The packing of anorectal wounds has probably caused more fecal incontinence than has poor surgery.

SUMMARY

The purpose of this discourse has been to try to indicate the desirable results of some anorectal surgical procedures and to suggest practical methods of obtaining such results. The lesions dealt with herein are those most frequently encountered, and attention is focused upon the fact that they often occur together, rather than singly, as is usually presupposed It is assumed that each patient's condition is an individual problem, and some methods of altering the basic technic to meet variations that will be encountered are outlined. It also will be noted that few, if any instruments, not found in the usual operating room are required. It is hoped that this discourse will encourage enthusiasm in the solution of anorectal problems, rather than the exercise of unimaginative timidity, such as sometimes exists.

DISCUSSION (*Abstract*)

Dr. E. H. Terrell, Richmond, Va.—When the patient first presents himself for examination, it is of utmost importance to gain his confidence. Most persons, before examination, are rather apprehensive and some of them skeptical. The physician's attitude and manner while taking the history will often relieve this sense of fear. Gentleness and tact are always in order and should be cultivated. There are, of course, a diversity of anorectal ailments which may demand attention by the physician and, since some of them are not easily recognizable, errors of diagnosis are likely to occur. Errors frequently are made because of insufficient and incomplete examination. Too often, also, conclusions are drawn hastily and the physican fails to evaluate the patient's symptoms correctly. For instance, an external hemorrhoid is not infrequently removed when the true cause of the discomfort is an infected crypt or fissure immediately above it. Of course, when an error of this sort is made, the patient's symptoms are not relieved.

I am opposed to the use of soapsud enemas, as suggested by Dr. Smith, for the purpose of cleansing the lower bowel as a preoperative measure. In fact, we consistently advise against the use of soap enemas, because of their irritating effects. We prefer either saline or soda water enemas. These answer the purpose fully, cause no congestion and do not irritate.

Success in most operative procedures in the anorectal region is dependent largely upon complete drainage as far as possible consistent with maintenance of the function of the parts. We, of course, are careful to ligate all bleeding points, but we usually have avoided suturing the wounds, preferring to leave them open to heal by granulation. The simpler the method employed, the better. It is doubtful that the technic in some of the operations described by Dr. Smith can be carried out satisfactorily by those who have little experience in rectal surgery.

In all rectal surgery the postoperative care is as important as the operation itself.

Dr. William J. Martin, Jr., Louisville, Ky.—Thirty years ago, more or less, proctology was almost in the realm of quackery. It was infested with secret formulas and methods. That which was being done by ethical practitioners was being done badly as a rule because of lack of knowledge of the anatomy of the anorectal region and the little understanding of the cause and character of pathologic changes. Little had been done to learn the anatomy and physiology of the parts. For instance, you still very frequently read and hear about the anal mucosa. It is astonishing to find how few know the line of demarcation of sensory changes in the anorectal region.

The number of persons who still think that anal conditions cannot be permanently cured is surprising. The old saying, "Once a rectal patient always a rectal patient," had some basis in fact as these conditions were once treated and too frequently are now treated. Why this belief on the part of the laity? Because there are still many being treated and operated upon by those who have not bothered to understand the anatomy, physiology and pathology of the anorectal region.

• It is frequently said by many who are not well versed in the knowledge of the anorectal region that those specially trained in proctology are too radical in their methods. This is frequently said by general surgeons who operate for hemorrhoids much as the general surgeon used to operate upon tonsils: what was protruding into the throat was amputated. Now a well trained nose and throat operator does a clean enucleation and rarely does tonsillar tissue grow back. Many still excise a few redundant pieces of skin in the anal region and ask that that pass for a hemorrhoidectomy. This is one of the types of anal operations too frequently done, which often is not curative and gives the laity the impression that anorectal conditions are difficult of cure.

Misconception of the hemorrhoidal operation described by Whitehead years ago did a great deal to bring operative measures for the cure of hemorrhoids into disrepute. The fact that few had taken the trouble to learn the anatomy of the region and as a consequence they failed in their interpretation of White-

head's description and failed to appreciate the all-important relation of anal skin to rectal mucosa, and failed at operation to restore this relation left many patients sitting on a protruding, weeping ring of rectal mucosa. This did a great deal towards bringing operative measures for the relief of hemorrhoids into disrepute. It was a great boost for the charlatans who claimed to cure all anorectal diseases "without using a knife" and led many to the popular, but often vicious, ambulant treatment of anorectal diseases.

To those of you who by choice or by necessity do this type of work I commend the very excellent methods recommended by our guest speaker. He has offered nothing that is not based soundly on the anatomy, physiology and pathology of the anorectal region. His methods are definitely not radical.

PRIMARY DYSMENORRHEA*

By WILLIAM BICKERS, M.D.
Richmond, Virginia

Disabling symptoms associated with menstruation fall into two classes. Nervousness, abdominal fullness, irritability and headache are the result of water retention secondary to the fixation of the sodium ion resulting from the high estrogen titer. It has been shown by Greenhill[1] that these symptoms can be relieved by a restricted salt diet and the administration of ammonium chloride, 15 grains three times a day, daily during the week before the onset of the menses. Menstrual cramps are based on a different pathologic physiology and must be approached from a therapeutic angle quite different from that of the premenstrual molimina. Although the endocrine changes will explain the moliminal symptoms, the acute spasmodic contractions of the myometrium, in the opinion of the author, are the result of abnormal muscle physiology not related to any endocrinopathy.

COMPARISON OF THE NORMAL AND DYSMENORRHEIC PATIENT

General Body Build.—Several years ago it was reported that dysmenorrhea was prone to occur in the sthenic type, more specifically those who had an exaggerated lumbar lordosis. This observation was not confirmed by others and it is now well known that dysmenorrhea occurs irrespective of body architecture.

Psychic Factor.—It is frequently stated that dysmenorrhea is largely a psychic phenomenon, occurring most often in the psychoneurotic woman. In this group of seventeen severe cases, nervous and emotional instability was observed in only three. Most disease states are classified as psychic until their true etiology is learned.

Age.—A large percentage of patients with menstrual cramps are under twenty-five years of age. Incidence of severe dysmenorrhea begins to decline sharply at the twenty-second year. A small group continues to have pain into the third decade, but their number is small and their response to therapy poor.

Family History.—In the seventeen cases which form a basis for this report there has been no consistent family history of dysmenorrhea. The number of patients having sisters with painful menstruation was not greater than those having sisters with normal menstruation.

Menstrual Regularity.—The incidence of dysmenorrhea is higher in patients with a normal menstrual rhythm than in those whose cycles are irregular. This is readily understandable now in the light of observations made by Hamblen,[2] Kurzrok and Wilson.[3] Painful menstruation occurs only in the presence of a corpus luteum, that is, following ovulation. In each of the seventeen cases here studied the painful menstruation came from a secretory endometrium as shown by endometrial biopsy. Menstruation from an estrogen endometrium such as that seen in the metro-menorrhagia of adolescence is always painless. This does not mean that every menstruation following ovulation is painful. It is only when a congenitally defective myometrium is present which responds abnormally to the corpus luteum secretions.

Endocrine Status.—Novak and Reynolds[4] demonstrated that estrogens are stimulating while progestin inhibits uterine contractions. From these observations on the rabbit it was postulated that patients with dysmenorrhea suffered either from estrogen excess or progestin deficiency. Logically it appeared that the administration of progestin would inhibit the uterine motility and relieve pain. Unfortunately, the human uterus is not inhibited by the administration of progestin.[5] Although the endocrinologic aspect of dysmenorrhea is worthy of consideration, there is not one piece of confirmed scientific evidence to show that the endocrine status of the dysmenorrheic is different from that of normal women. Indeed, the ovarian function of these patients is more consistently normal as shown by the consistent presence

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of a corpus luteum. The regular appearance of ovulation in dysmenorrheic patients is the best possible evidence of normal gonadotropic hormone production and normal ovarian response. In all probability, and this report will lend evidence to the fact, painful menstruation is the result of abnormal physiology in the myometrium not related to any endocrine changes.

Gross Anatomy of the Uterus.—The bicornuate uterus is usually a dysmenorrheic one; otherwise the gross anatomy of the painfully menstruating uterus is not different from the normal one. The incidence of infantilism, anteflexion, and retroversion in these seventeen patients was not different from that in a similar group of controls.

Histology of the Uterus.—A careful comparison of the endometriums obtained from these seventeen dysmenorrheic uteri shows no changes from the normal. In one of these patients it was possible to obtain a biopsy of the myometrium at the time of laparotomy and the histologic section shows no variation from the normal.

Myometrial Physiology.—Here is the only place where a striking and consistent difference can be demonstrated between the painful and the non-painful menstruating uterus. Kymographic tracings of the uterine contractions during painful menstruation show a spasm of the myometrium which is never seen in the normal uterus. The high amplitude menstrual contractions in the normal uterus are painless because there is complete relaxation of the myometrium between each contraction. This is in contrast with the high amplitude menstrual contractions superimposed on spasm as seen in dysmenorrhea. The following experiment demonstrates this.

TECHNIC OF EXPERIMENT

A graphic kymographic tracing of uterine contractions has been recorded on seventeen patients with severe dysmenorrhea. The first tracing in each patient was taken a day or two before the onset of the menses and the second tracing on the same patient was recorded during menstruation and while she was suffering her most severe pain. These tracings are compared with similar ones taken on patients with painless menstruation.

To record these tracings a small condom balloon, 3 c. c. capacity, was attached to a woven ureteral catheter. Under aseptic precautions a small sound was passed through the cervix and this tiny balloon was introduced without difficulty. The ureteral catheter was connected by a tube to a specially designed ink recorder. The balloon was filled with sterile water until a distending pressure of 40 mm. of mercury was recorded. Each contraction of the uterus produces pressure on the balloon and this impulse is conveyed through the water column to a bellows and lever system which operates the writing point on the kymograph (*Fig. 1*). At the conclusion of each experiment the patient was given morphine sulfate, 1/4 grain, in order to establish the base line for each uterus. A spastic uterus will relax under morphine and the writing point will drop to a lower level, while in the normal uterus there is no spasm and morphine produces no change in the base line. A means of differentiating the normal from the spastic uterus was thus established.

UTERINE CONTRACTIONS IN THE NORMAL AND DYSMENORRHEIC UTERUS

The pattern of uterine contractions throughout the normal menstrual cycle has been de-

Fig. 1

A small condom balloon 3 c. c. capacity attached to a flexible woven catheter is inserted into the uterine cavity. This is connected by a rubber tube to a mechanical ink recorder so placed that the writing point records the contractions on a revolving kymograph.

scribed by Kurzrok and Wilson.[6] Their observations on the normal uterus have been confirmed by my investigations.[7] During the first half of the cycle the uterine contractions are low in amplitude; frequent, two to three per minute; and are superimposed on a moderate degree of tonus. A few days after ovulation the uterus comes under progestin influence, the contractions become increased in amplitude, tonus is abolished, and the rate is reduced to about one per minute. This type of contraction persists throughout menstruation. In the dysmenorrheic uterus the pattern of motility is the same until the onset of the menses when the myometrium, responding abnormally to the stimulation of menstruation, is thrown into spasm. Examination of the tracings will show this spasm; the uterus does not relax between contractions and this lack of rest interval between contractions must interfere with the normal oxygenation and nutrition of the myometrium (*Fig. 2*). Muscle contraction in the presence of anoxia is associated with pain. This is in my opinion the pathologic physiology of dysmenorrhea. It confirms the observations of Moir.[8] Since it has been impossible to demonstrate any factor extrinsic to the uterus that might cause this spasm and since the endocrine status is normal, it is reasonable to assume that the abnormal behavior of the muscle is the result of a physiologic defect in the muscle itself, probably congenital.

EFFECT OF DRUGS ON UTERINE CONTRACTIONS IN DYSMENORRHEA

The effects of certain commonly employed drugs upon uterine contractions in dysmenorrhea have been studied. The tracings graphically revealed the effects of these drugs.

Atropine.—On the assumption that menstrual cramps may be related to parasympathetic nerve stimulation, this drug has been often used. No effect on the intact human uterus can be demonstrated.

Ephedrine.—This drug has been used for its sympathicomimetic action, hoping thereby to relax the uterus. No effect could be demonstrated in three patients who received 3/4 grain

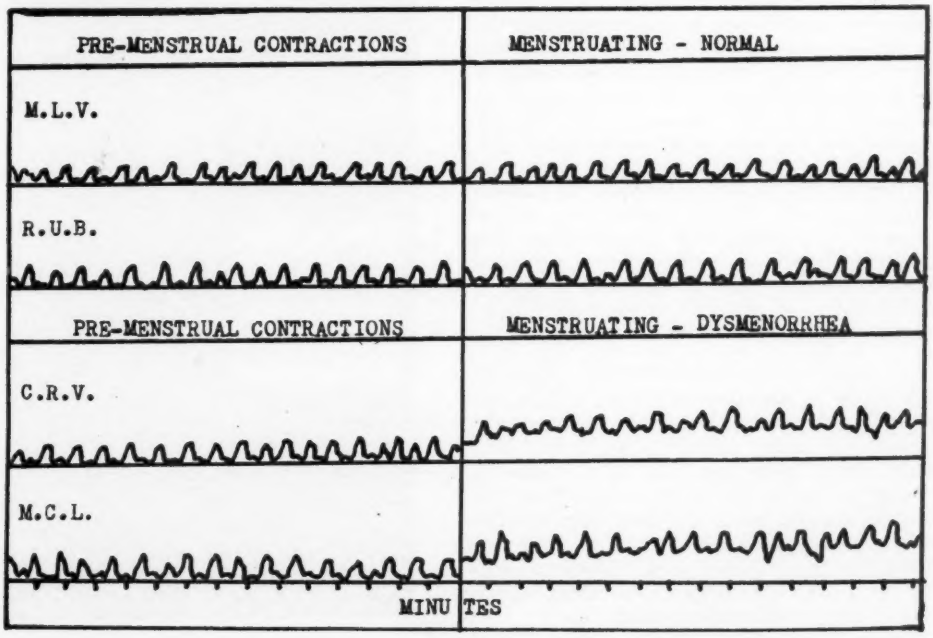

Fig. 2

Premenstrual contractions in both the normal and dysmenorrheic uteri are high in amplitude, occur about one per minute and are atonic. The writing point returns to the base line after each contraction. This pattern of motility persists through the first day of non-painful menstruation. In dysmenorrhea the uterus becomes spastic with superimposed contractions, the writing point does not return to the base line. This is the pathologic physiology of dysmenorrhea.

three times a day for two days prior to the menses.

Epinephrine.—In doses of as much as 1 c. c. subcutaneously no inhibitory effect on the uterus could be shown.

Calcium Gluconate.—Given intravenously in doses of 10 c. c. of the 10 per cent solution no effect could be shown.

Benzedrine Sulfate.—Two patients were given this drug in doses of 10 mg. No effect could be demonstrated.

Pavatrine.—This is a new non-narcotic spasmolytic drug which will soon be released. In contrast with most other antispasmodic drugs which act by way of the autonomic nerves this drug has a more papavarine-like action in that it acts directly on the smooth muscle fiber. This is a most important point because uterine motility is almost entirely independent of nervous control, its rhythmic action being a property of the muscle itself. Any drug to be effective must act directly on the muscle fiber. In the tracing, a marked drop was noted in spasm as well as the amplitude of contractions after the administration of pavatrine, 50 mg. intravenously or 225 mg. orally. Unfortunately, this marked spasmolytic action cannot be demonstrated on every dysmenorrheic uterus. In my experience it is possible to abolish spasm in about one-third of all dysmenorrheic uteri with pavatrine.

EFFECTS OF HORMONE ON UTERINE CONTRACTIONS IN DYSMENORRHEA

Successive tracings have been taken each month on a patient with severe dysmenorrhea after treatment with the hormones.

Estrogen.—It has recently been suggested that dysmenorrhea can be relieved by giving very large doses of estrogen in the first half of the cycle to the point where the gonadotropic hormone is inhibited and ovulation does not occur.[9] In my experience this can rarely be done even with large doses of stilbestrol; but even though it were possible, the inherent dangers of repeatedly inhibiting ovulation in young girls must be recognized. In a case where I was able to inhibit ovulation with stilbestrol the high amplitude contractions of progestin influence did not appear, the patient menstruated from an estrogen endometrium, and there was no pain. Usually it is not possible to demonstrate any effect of estrogen upon the intact human uterus.

Progesterone.—It is well known that this hormone will abolish spasm and inhibit motility in the rabbit uterus. No such inhibition can be demonstrated in the human. (*Fig. 3*).

Testosterone.—It has been shown in laboratory studies that this hormone, closely related to progesterone in many of its physiologic effects, will inhibit uterine motility. No such inhibition can be demonstrated on the intact human uterus.

EFFECT OF STEM PESSARY ON UTERINE CONTRACTIONS

One hesitates to resurrect from the limbo of forgotten things the much maligned stem pessary. However, its place in the treatment of those cases of severe dysmenorrhea which do not respond to medical therapy is, in my opinion, very real and valuable. No less authority than Weir[10] and also Kennedy have recently advocated the use of the stem pessary. The instrument fell into disrepute because it was used in-

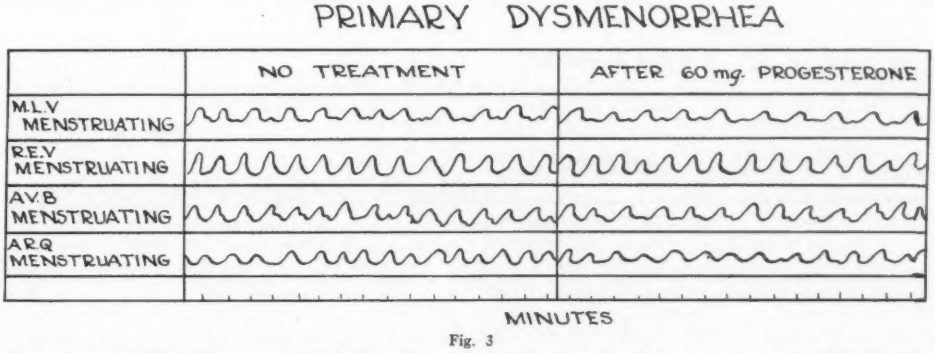

Fig. 3

Contractions recorded during painful menstruation show the typical spasm. No effect upon the contractions can be seen after 60 mg. of progesterone.

discriminately without due regard to surgical principles. Carelessly used without adequate follow-up of the patient, leaving the instrument in more than six weeks, poor selection of the instrument used, trauma incident to curettage preceding its insertion, all contributed to its complications. Experience with something over one hundred cases in which the stem pessary was used has convinced me of its value and safety when wisely and judiciously used. In the majority of cases the insertion is an office procedure. Dilatation of the cervix with a very small dilator can be accomplished readily in the office if this be done on the last day of menstruation while the cervix is yet soft and patulous. Under strict asepsis a small flexible stem pessary is readily passed and this is left in place for six weeks, never longer.

How does the pessary work? It is well known that the uterus responds to any foreign body by vigorous contractions in an effort to expel it. These expulsive contractions over a period of six weeks result in hyperplasia and increased vascularity of the myometrium. The treatment for congenitally defective muscle anywhere in the body is exercise. Why not exercise the uterus? Shown in *Fig. 4* are the tracings from three dysmenorrheic uteri before and after the insertion of a stem pessary. It will be noted that the physiology of the spastic myometrium has been altered until its contractions are normally atonic and therefore painless.

CONCLUSIONS

(1) The normal and the dysmenorrheic patient have been compared according to general body structure, psychic factors, age, family history, menstrual regularity, endocrine status, anatomy of the uterus, histology of the uterus, and myometrial physiology. It has been shown that the only difference in the two groups is the consistent alteration in myometrial physiology in the dysmenorrheic uterus.

(2) Kymographic tracings of uterine contractions during menstruation have been taken on seventeen dysmenorrheic patients and a group of normal controls. Myometrial spasm was demonstrated in the dysmenorrhea group.

(3) It was shown graphically that atropine, ephedrine, epinephrine, calcium gluconate, and benzedrine sulfate did not abolish this spasm. A new spasmolytic, non-narcotic, papavarine-like drug, pavatrine, will abolish myometrial spasm and inhibit uterine contractions in about one-third of the dysmenorrheic uteri.

(4) Estrogen, progesterone, and testosterone do not alter the pattern of uterine motility in the human uterus.

(5) The flexible stem pessary inserted as an office procedure on the last day of menstruation will act as a foreign body to stimulate a congenitally defective myometrium to expulsive contractions with improvement in the myometrial physiology. In a majority of patients with dysmenorrhea the spasm of the uterus will

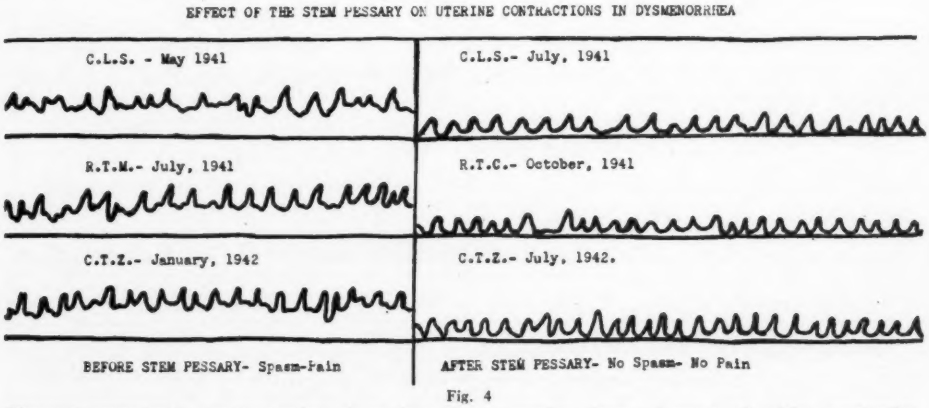
EFFECT OF THE STEM PESSARY ON UTERINE CONTRACTIONS IN DYSMENORRHEA
C.L.S. - May 1941
C.L.S.- July, 1941
R.T.M.- July, 1941
R.T.C.- October, 1941
C.T.Z.- January, 1942
C.T.Z.- July, 1942.
BEFORE STEM PESSARY- Spasm-Pain
AFTER STEM PESSARY- No Spasm- No Pain

Fig. 4

Menstrual contractions in the three patients shown above, show a complete absence of spasm and painless menstruation after six weeks with the stem pessary.

Initials R.T.C., second division on the right is an error. It should be R.T.M.

be abolished after the pessary has been in place for six weeks, as shown by kymographic tracings.

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Medical Arts Building

DISCUSSION (*Abstract*)

Dr. M. Y. Dabney, Birmingham, Ala.—The uterine contraction tracings are especially illuminating and the antispasmodic action of pavatrine in some of the cases reported by Dr. Bickers is encouraging.

It is difficult to explain the absence of reference to the excellent work of Dr. Frederick Falls and his associates, of Chicago, who were able to secure inhibition of spasm of the uterine muscle and to delay emptying of the human uterus by the use of certain preparations of corpus luteum. The latter investigators found a marked variation in the antispasmodic action of different preparations of corpus luteum, some being entirely inactive in that regard, depending upon the method of their manufacture. The older, water-soluble extracts were more active in preventing uterine contractions than the oil soluble ones. Purified progesterone was not active in preventing contractions of the rabbit's uterus. Progesterone has been shown by Seelye, of Montreal, to have a powerful sedative or anesthetic action upon small rodents, so that these may be operated upon under its influence. Herein lies a possible explanation of its reported clinical activity in relieving dysmenorrhea. Laboratory evidence suggests the possibility of more than one corpus luteum hormone.

Clinically, gynecologists have had abundant experience in relieving dysmenorrhea and apparently prolonging gestation in patients with threatened abortion by the use of certain corpus luteum preparations.

Dr. Karl John Karnaky, Houston, Tex.—The first and most important thing in the treatment of dysmenorrhea in a young girl is to gain her confidence. This may be accomplished if she obtains immediate results and this may be done by giving her a 5.0 mg. tablet of diethylstilbestrol every night at 9 p.m. for 40 to 60 nights. The patient will have an anovulatory bleeding which is painless. After the diethylstilbestrol is discontinued the painful menstruation will return and will necessitate further treatment. However, the physician in charge will find it easier to handle his young patient because she is confident relief can be obtained.

A large percentage of dysmenorrhea cases have not sought to obtain any relief until the pain has become very severe. In such cases, we have found that an injection of 5 c. c. of 0.5 per cent procaine borate into the anterior wall of the cervix will give immediate relief during that menstruation. This is an emergency treatment which is very simple to give.

Many cases of dysmenorrhea are psychic in origin because the patient has no pain until the blood is seen. In the Menstrual Disorder Clinic of the Jefferson Davis Hospital, Houston, Texas, I have produced pseudomenstruation, and they still have pain upon the first sight of blood. Everyone knows that the flow leaves the uterus 6 to 24 hours before it is seen. If the patient has no pain until the flow is seen, it must be psychic.

A patient at our hospital wore a stem pessary for 6 weeks and had an alcoholic injection into the Frankenhauser ganglion, but without any relief. After an emergency appendectomy (no other surgery done) she has had no painful menstruation. This case was apparently psychic.

Over 100 cases of dysmenorrhea have received 3 c. c. of 85 per cent ethyl alcohol injected into the Frankenhauser ganglion. Relief was obtained in 67 cases for 1 to 3 years. Few patients have had to have 3 or 4 injections. Within 1 to 3 years after this injection we have done ureteral catheterization and x-rays have been made, but we have been unable to find stenosis of the ureters as was suggested by some. In only 8 instances has an artery been struck. In such cases the treatment was not given until after the next menstruation. By injecting gentian violet into the Frankenhauser ganglion before a hysterectomy we have been unable to observe any harm from this type of treatment.

Dr. Bickers has shown a new technic of destroying the presacral nerves, namely: by injecting alcohol into the presacral region. This is much better than the operation, which is a very dangerous procedure regardless of who does it. We have done 22 presacral sympathectomies and dissected the presacral nerves in over 50 postmortem cases. From this one could see how dangerous it is to do this type of operation. Following the injection of the alcohol into the presacral region it is absorbed into the smallest nerve, that could not be noticed in an operation.

The uterector, which is probably new to most of us, has been used by Dr. Bickers and has been reported to be very successful in the relief of dysmenorrhea. I am planning to use the uterector in the treatment of dysmenorrhea as soon as I can get back to the menstrual disorder clinic in Houston, Texas.

Dr. John E. Cannaday, Charleston, W. Va.—I do not believe that the pain relieving effects of alcohol injection would be at all likely to be permanent. It would seem to me that the alcohol might also damage other important structures in that area.

At the 1935 meeting of the Southern Surgical Association I reported thirty-two cases of dysmenorrhea that had been treated by presacral nerve resection. These cases had been carefully followed up over a considerable period of time. The end results were found to be as follows: eighteen had complete relief, nine showed considerable improvement, five no improvement.

In regard to what has been said about the troublesome oozing following nerve resections, I had some trouble of this kind myself in two or three cases. However, I believe that troublesome oozing is usually incidental to improper technic and can, as a rule, be avoided.

In the days when the gasserian ganglion was injected with alcohol for the relief of trifacial neuralgia, the relief usually lasted for no longer than a year, oftentimes less, and had to be repeated.

The observations of many others as well as myself have been that satisfactory results cannot be usually expected from presacral nerve resection unless the dysmenorrhea is of the primary type, deep seated in location and limited to the menstrual period. Dysmenorrhea resulting from pelvic inflammation or dysmenorrhea in patients who suffer from intermenstrual pain is usually not benefited by presacral nerve resection.

SOME OBSERVATIONS ON THE USE OF NICOTINIC ACID AMIDE AS AN ADJUNCT IN OBSTETRIC ANALGESIA*

A PRELIMINARY REPORT

By J. RANDOLPH PERDUE, M.D.
Miami, Florida

The ideal obstetric analgesia has not yet been found. Various combinations of barbituric acid derivatives and hyoscine form the basis of perhaps the most widely used methods. In the hands of a few men, results have been excellent. However, the average obstetrician in the average hospital is often deterred from attempting to secure complete analgesia by fear of two things: (1) a sleepy, difficult to resuscitate baby and (2) a restless, occasionally violent, mother.

The object of this preliminary report is briefly to summarize results obtained in 159 consecutive cases by adding nicotinic acid amide to the barbiturate-hyoscine method of analgesia in obstetrics.

Nicotinic acid amide (pyridine beta-carboxylic acid amide) is vitamin PP, formerly called vitamin G, after Goldberger,[5] who first showed that pellagra was a deficiency disease in 1922. Although nicotinic acid has long been known,[6] its biological significance was not recognized until comparatively recently. Warberg, in 1935, found[13] that at least two enzymes were necessary to free utilization of oxygen in the individual cell. He further demonstrated that these co-enzymes could not carry out their function in the body unless an adequate amount of nicotinic acid amide was present. Numerous investigators have studied this fundamental biological reaction and agree that "it is the nicotinamide residue in the molecule which permits them [coenzymes] to effect a transfer of hydrogen essential to a chain of reactions by which intracellular oxydation is accomplished."[10]

In other words, nicotinic acid amide must be present, in sufficient amounts, before oxygen can be properly utilized where respiration really occurs in the individual cell.

Now, it is axiomatic that an adequate supply of oxygen is necessary to well being. Relative maternal anoxemia has been shown to have a most unfavorable effect on the unborn child.[2] Relative anoxemia in adults may produce apprehension, dulling of the sensorium, insubordination to authority, violence and, finally, collapse. These phenomena have been graphically demonstrated by workers in the low pressure chamber at the United States Naval Air Station, Opa Locka, Florida.[12] (It is most striking to see a well disciplined cadet yell "Whoopee" and thumb his nose at his commanding officer when he reaches the equivalent of 15,000 feet altitude in the low pressure chamber. His reactions become normal immediately when an oxygen mask is applied. Some cadets can go much higher than others before these changes are observed.)

The parallel between behavior of some patients under barbiturate-hyoscine narcosis, with lowered rate and depth of respiration, and patients with induced anoxemia, led this essayist to suspect that a fundamental deficiency in oxygen utilization may exist in a small percentage of our patients. Such a deficiency could reasonably be assumed to exist, simultaneously and possibly with more pronounced physiologic consequences, *in utero*. For these reasons the present study was undertaken.

All patients herewith reported were white, private patients in good general health. They had negative Kahns. Toxemia, though present in 7 cases, had no bearing on this report. All labors were conducted in the hospital, in especially planned labor rooms, free from visitors. Practically all patients were constantly under observation of trained labor nurses employed through my office. All patients received 1 mg. of synthetic vitamin K and 100 mg. of nicotinic acid amide on arrival. Circumstances of labor permitting, all patients received 3 grains of sodium pentobarbital and 1/150 grain of hyoscine when labor was established or when they requested it. Most primipara and many multipara received an additional 1/200 grain of hyoscine and 3 to 4½ grains of sodium pentobarbital as labor progressed.

Morphine and other opiates were used rela-

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tively infrequently and in small (1/8 to 1/6 grain) doses. However, two patients delivered within 2 hours of 1/4 grain of morphine and one patient delivered who had had (by duplication) two 1/6 grain doses of morphine sulphate within two hours of delivery. Each patient had additional nicotinic acid amide subcutaneously and their babies required no resuscitation.

Nicotinic acid amide was often repeated 2 or 3 times as labor progressed or, particularly, if unusually heavy sedation was required. Most of this was given subcutaneously and in 100 mg. doses. Paraldehyde was used occasionally, either by mouth or rectum. Rectal ether was not used in any case herewith reported.

Anesthesia in almost every case was cyclopropane, and I highly commend this anesthetic to all obstetricians who have qualified anesthetists at their disposal. Drop ether or nitrous oxide were used in emergencies or in the absence of trained anesthesia department personnel.

Table 1 shows the distribution of material. Cases are consecutive to avoid improper discard methods.

You will notice (*Table 2*) that low or outlet forceps were used in most cases. The babies (*Table 3*) breathed spontaneously in over 95 per cent of cases. This does not mean they immediately cried lustily, but they remained warm and in good condition and breathed when they chose. A tub of warm water and a mechanical respirator are occasionally useful. "Coramine" (1 to 4 minims) given in the cord is an excellent respiratory stimulant, though rarely needed. Subcutaneous injections are probably of no value except as irritants.

We had 4 macerated fetuses, 2 unexplained (*Table 4*) and our two stillborns were deliberate craniotomies. Each cranial cavity contained over a liter of fluid and vaginal delivery was impossible without drainage.

MATERIAL

(1) Period of time	Feb. 10 to Oct. 25, 1942
(2) Number of cases	159
(3) Primipara	91 (57 per cent)
(4) Multipara	68 (43 per cent)
(5) Twins	1
(6) Hydatid mole	1
(7) Maternal mortality	0
(8) Fetal mortality (gross)	10 (6.2 per cent)

Table 1

METHODS OF DELIVERY

Episiotomy, left-mesio-lateral, was done in nearly all cases.

(1) Spontaneous delivery	27
(2) Low or outlet forceps	106
(3) Mid forceps	14
(6 double applications)	
(4) Version and extraction	1
(5) Breech extraction (1 twin)	6
(6) Cesarean section	6
(5 low cervical, 1 classical)	

Table 2

CONDITION OF BABIES

Born alive	153
Breathed spontaneously	145 (95.2 per cent)
Required resuscitation	8 (4.8 per cent)

(1) Abruptio at 8 months (section) lived 8 hours.

(2) Premature. 35 weeks (atalectasis) lived 12 hours.

(3) Full term. Fetal distress. Almost complete lack of Wharton's jelly. Mid forceps.

(4) Full term. Fetal distress, cord 4 times around neck. Low forceps.

(5) Second twin. Breech. Extended head. Attempts at respiration. Piper forceps.

(6, 7, 8) No cause. One had no medication or anesthesia by request.

Table 3

FETAL MORTALITY

(1) Macerated	4
(a) Cause undetermined	2
(b) Cord 5 times around neck	1
(c) Cyclops, etc.	1
(2) Intrapartum Deaths	2
Both were large hydrocephalics	
Breech delivery and craniotomy	
(3) Neonatal Deaths	4

Table 4

Neonatal Deaths 4 (2.4 per cent)

(1) Abruptio placentae at 8 months. Section. Lived 8 hours.

(2) Premature labor at 35 weeks. Atalectasis. Lived 8 hours.

(3) Full term. Simple delivery. Considered normal by pediatrician. Sudden death the eighth day. Autopsy.

(4) Persistent occiput posterior. Long labor. Mid forceps rotation. Found dead in nursery after apparently normal nursing. 36 hours old.

Table 5

Only one of the four neonatal deaths was in a patient who had an attempt at amnesia (*Case 4*), so we feel justified in claiming no connection between mortality and drug therapy in 9 out of our 10 cases. *Table 6* shows observations on the mothers under sedation reinforced with niacin amide and *Table 7* details our amnesia results.

DISCUSSION

Although our percentage of satisfactory amnesia falls far short of many published series, we like to believe that some of our colleagues have a similar problem. Of one thing I am certain, nicotinamide has not decreased our percentage of amnesia.

We believe that our patients, both mothers and babies, have shown a more constant behavior under sedation and anesthesia when reinforced with niacin amide.[7] Our labor room nurses share with us the belief that, under barbiturate-hyoscine analgesia, we have fewer restless mothers and fewer babies who do not breathe spontaneously at birth.

The physiology, metabolism and excretion of nicotinamide are very little known. We are unable to find any such studies on the pregnant woman. We do know that toxicity is very low.

CHARACTER OF LABOR	
Length, no appreciable effect	
Respiration deep, quiet, less stertor (general clinical observation only)	
Respiratory rate, none below 14 per min. No periods of apnea noted	
Color excellent. No cyansois noted in any patient	
Patients restless or noisy	9 (5.7 per cent)
Patients requiring restraint	2 (1.2 per cent)

Table 6

AMNESIA			
"No attempt" (including 6 sections)	(21.4 per cent)	34	
100 per cent amnesia	(41.5 per cent)	66	64.1 per cent
Good	(22.6 per cent)	36	or 81.6* per cent
Fair	(9.4 per cent)	15	13.8 per cent
Poor	(4.4 per cent)	7	or 17.6* per cent

*Percentage obtained by omitting the "no attempt" group.

Table 7

Pearlsweig and co-workers[8 9] took 500 mg. daily for long periods of time without symptoms, nor were they able, ever, to recover more than 40 per cent in the urine.

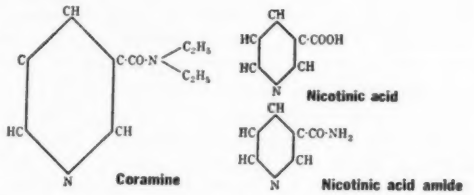

Fig. 1

The similarity between "coramine" and nicotinamide is biological as well as chemical (*Fig. 1*). Both are unsaturated oxygen substitution radicals of pyridine beta-carboxylic acid.[1] The work of Elvehjem[3 4] and Ruffin and Smith,[11] suggests that the body is able to utilize many of the pyridine beta-carboxylic acid derivatives quantitatively, in the best known measure of their biologic activity, that is, in overcoming the deficiency responsible for pellagra. It is interesting to speculate as to whether or not further study will indicate a closer relationship between these two substances.

Finally, we do not fully understand the amount of nicotinamide needed by the pregnant woman and her offspring. There is no harm and considerable possible good in providing a liberal amount during labor.

SUMMARY

(1) One hundred fifty-nine consecutive patients were given nicotinamide during labor under barbiturate-hyoscine analgesia.

(2) Less maternal restlessness was noted and considerably fewer babies required resuscitation.

(3) A physiologic basis for these observations is outlined.

(4) The chemical and biologic relationship between "coramine" and nicotinamide is mentioned.

(5) Large doses of nicotinamide during labor have no disadvantages and may be of considerable value.

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DISCUSSION (*Abstract*)

Dr. M. Pierce Rucker, Richmond, Va.—The theory that Dr. Perdue advances is a very attractive one, namely, that the excitement of the mother and the apnea of the baby that one often encounters in barbiturate-scopolamine analgesia are due to anoxia, and that nicotinic acid amide in promoting the utilization of oxygen in the cell has a tendency to overcome the anoxia. I do not believe we as a rule realize the importance of oxygen in labor. Recently I have become fond of sodium ethyl thiobarbiturate intravenous anesthesia, and I have noticed that if the patient is allowed to breathe oxygen during her anesthesia, the baby cries more promptly even when there has been no visible evidence of anoxia in the mother. That is the nearest that my work comes to confirming Dr. Perdue's theory. I use a great deal of sodium iso-amylethyl-scopolamine analgesia and can appreciate the importance of Dr. Perdue's work if it is confirmed. The arresting factor in Dr. Perdue's paper is the fetal mortality. The unexplained deaths, numbers 6, 7, and 8, I believe are somewhat disturbing. I would like to ask Dr. Perdue how this 6 per cent fetal mortality compares with that of his cases in which nicotinic acid amide was not used.

Dr. Charles W. Dorsey, Roanoke, Va.—Dr. Perdue mentioned that he repeated the nicotinic acid amide at intervals during labor, as needed. He did not mention the criteria for this repetition, nor the amount of the dosage subsequent to the first dose. I would appreciate it if he would give both these items in his final discussion.

Dr. Perdue (closing).—It is very difficult to say when a therapeutic agent is effective. Morphine may certainly show a wide variety of actions. I appreciate, Dr. Rucker, your reminder that our fetal mortality rate is not clear. Perhaps we could restate it this way: eleven of our 159 mothers left the hospital without babies. Of these, one had a hydatid mole, four had macerated fetuses, and two had large hydrocephalies. There were four neonatal deaths (2.4 per cent): of these, two were more than one month premature and one died suddenly at eight days with no previous symptoms. The fourth died 36 hours after a major operative delivery.

In closing I should like to leave the thought that in niacin amide we may have a fundamental biologic activator, as much like thyroid or epinephrine as like a vitamin.

THE TREATMENT OF CONGENITAL SYPHILIS WITH ACETARSONE (STOVARSOL)*

THE RESULT OF A 10-YEAR STUDY

By JAY M. ARENA, M.D.
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In the past decade, much has been written about the treatment of congenital syphilis with oral acetarsone (stovarsol). At first the reports were enthusiastic and favorable, but more recently the effectiveness of this oral spirocheticide has been questioned for the following reasons:

(1) The effective dose of acetarsone is too near the toxic dose to be used indiscriminately.

(2) Rabbit experiments show that the toxicity of orally administered acetarsone is too variable to justify its use in human subjects.

(3) A high percentage of patients treated with acetarsone have relapses.

(4) The action of acetarsone is less rapid than that of arsphenamine, and it is less effective in arresting congenital syphilis.

(5) No adequate experimental background for the determination of the toxicity and spirocheticidal effects of individual lots of acetarsone are available.

(6) In a large series of treated cases there were 10.7 per cent reactions, of which 4.6 per cent were serious, particularly nephritis, which occurs suddenly and insidiously and is the greatest drawback to acetarsone therapy.[1]

(7) Acetarsone is probably not administered at home as directed, for controls in a hospital had four times as many toxic reactions.

(8) Acetarsone has little or no effect upon interstitial keratitis.

(9) Regularity of attendance has not been increased by oral therapy.

(10) Careless parents are being trusted with a toxic drug.

Among the comments of those favorable to the use of acetarsone therapy are the following:

(1) The drug is easily administered without the psychic and mental trauma incident to parenteral injections.

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*From the Department of Pediatrics, Duke Hospital and Duke University School of Medicine.

(2) Numerous investigators have given acetarsone a fair trial and have had favorable results.

(3) Lyon and O'Neil[2] in a comparative study of acetarsone and parenteral arsenicals found results about equal.

(4) The effect on the active lesions of syphilis (other than interstitial keratitis) is good.

(5) Better results are obtained if bismuth is given during the rest period of six weeks.

(6) The method of Bratusch-Marrain[3] for dosage is an improvement over older dosages.

(7) Fever, vomiting, diarrhea or a skin rash is the indication on which the mother is taught to stop the drug. Any mother who cannot recognize these symptoms probably will not raise a decent child anyway.

(8) The reactions are not ordinarily serious and may be reduced by avoiding excessive doses and discontinuing the drug at the first sign of intolerance.

(9) Acetarsone has a definite tonic effect in many infants. Weight gain, increase in hemoglobin and a better appetite are constant findings.

(10) The serologic response in infants is as good as that obtained with standard preparations.

Since 1931, in our clinic the administration of acetarsone by mouth has been the treatment of choice for congenital syphilitics, under the age of 5 years. No infant was treated unless the stigmata of syphilis were present or the Wassermann reaction persisted positive on repeated tests during the first two months of life. In recent years early clinical manifestations of congenital syphilis have become less frequent because more pregnant women are being treated. For that reason the clinical diagnosis of early congenital syphilis and therefore also the evaluation of treatment results are more difficult. If the infant did not actually have syphilis, yet received treatment because this fact was obscured, the antiluetic treatment given, of course, would result in negative findings in regard to syphilis. This applies particularly to infants to whom acetarsone is given because of positive serologic reactions in the mother without establishing the diagnosis of syphilis in the infants themselves. At first the dosage of Bratusch-Marrain was tried, but for the past five years a modification of this plan has been in use (*Table 1*). Following the 8 weeks' course of acetarsone a weekly intramuscular dose of bismuth is given for 6 weeks. The two drugs are continued in this manner until treatment has been completed.

Period of Treatment	Dose Mg. Per Kg. of Body Wt.	Times Daily
2	5	1
2	10	1
2	15	1
2	20	1

Table 1

Eighty-eight infants had twelve to twenty-four months treatments. Of these 53 (60 per cent) were under one year and reversal of the Wassermann reaction occurred in 47 (88 per cent). In the older group (1-5 years) only 70 per cent had serologic reversal. In 21 patients under one year of age who had only 6-12 months of treatment there was a reversal in 76 per cent, as compared to 50 per cent in 27 older children (*Table 2*). Clinical signs of syphilis (excluding x-ray findings in the infants) were noted in 57 patients, or 42 per cent of all cases. Reactions occurred in

	Number of Patients		Clinical Signs		Wassermann Reversal				Reactions*	
	Under 1 Yr.	1-5 Years	No.	Per Cent	Under 1 Yr.		1-5 Years		No.	Per Cent
					No.	Per Cent	No.	Per Cent		
12-24 Months Treatment	53	35	42	47	47	88	24	70	7	8
6-12 Months Treatment	21	27	15	31	16	76	13	50	3	6.2

*Gastro-intestinal 5
Dermatitis 3
Nephritis 2

Table 2

7.3 per cent of the patients, but in only two did urinary findings develop which were consistent with a diagnosis of nephritis. Of the 100 patients who had serologic reversals 68 were seen in subsequent years and in only 7 had the Wassermann reaction again become positive. All of these occurred in the group that had only 6-12 months of treatment.

In our experience with a small group of congenital syphilitics we have found that the combined use of acetarsone and bismuth is advantageous and useful, especially in the group under one year of age where results have been particularly satisfactory. Negroes comprise 95 per cent of our congenital syphilitic patients and the parents are invariably "needle shy." Cooperation is always difficult to obtain. These people have a change of address every other month and with very little social service assistance at our command it was surprising that many returned of their own accord with the children for treatment. If parenteral injections were resorted to with all of these infants, a very small percentage would have completed treatment. The problem as we have it in our location is vastly different from what one would see in the clinic of a large Eastern city. The problem of transportation to the clinic, the constant change of living quarters (which makes it impossible to keep up with them) and the casual attitude towards syphilis as a whole all make for irregular treatment. It has been our experience that completion of treatment can be better accomplished with the use of acetarsone, particularly in small infants. Even though better results may have been obtained with parenteral arsenicals, still the number that would have completed treatment in our clinic would not justify its use.

CONCLUSIONS

(1) In a small clinic with little social service assistance the use of oral acetarsone and bismuth is not only advantageous but effective.

(2) The combined use of these drugs is more efficacious in the treatment of infants under one year of age than it is in older children.

(3) Complications occurred in 7.5 per cent of all cases. Only 2 cases of nephritis occurred in 136 treated patients.

(4) The use of acetarsone should be limited to infants under one year since mothers are more apt to carry out treatment and the results are satisfactory. Older infants should be given parenteral arsenicals since the injections can be given without undue difficulty and the results are better.

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DISCUSSION (*Abstract*)

Dr. Frank R. Smith, Jr., Baltimore, Md.—There has ever been a desire to discover an oral medication for syphilis. There have been scores of new drugs developed which for one reason or other have been abandoned. So with a great promise acetarsone (stovarsol) was introduced. It had its early difficulties when the question of proper dosage was being worked out. It has been praised by pediatricians, and damned by syphilologists treating only adult patients.

Dr. Arena has made a most valuable contribution to the subject of its use. In evaluating the use of any newer drug I think that the following questions must be answered:

(1) Is it any more effective than others?

Acetarsone is satisfactory, especially in young infants, that is, in early congenital syphilis. Under it lesions heal, serologic response occurs, general improvement takes place. But no one has shown that by its use the length of time of treatment is shortened. All thoughtful writers use it as an arsenic compound, alternate it with a heavy metal (usually bismuth) and continue courses for from a year to eighty weeks. Sulpharsphenamine works as well.

(2) Is the ease of administration greater?

Pillsbury and Perlman (*Arch. Derm. and Syph.*, 39:969, 1939) have answered this question in a very effective paper. A number of us have had similar experiences no doubt. It is seemingly easier to give a pill than an injection, but the regularity of attendance response is no greater under a regime of oral medication than of parenteral. The so-called psychic shock to an infant receiving an injection is no greater than that caused by being forced to swallow a crushed tablet which is insoluble in water.

(3) Is it more toxic than other drugs?

Sulpharsphenamine is not used in an adult because of its toxicity. But somehow children tolerate satisfactory doses of this drug without evidences of undesirable reactions. The syphilologist has found that in therapeutic doses acetarsone gives too many toxic reactions to make it a safe drug. But children, with their ability to tolerate both drugs well, rarely develop toxic reactions with the lower doses outlined by the Bratusch-Marrain formula or that of the modification recently suggested by Rosenberg and Faulkner (Acetarsone in Syphilis, *Jour. Ped.*, 18:750, 1941).

(4) Is it, all other factors being equal, as cheap as other equivalent preparations?

The factor of cost enters whenever a clinic head has a budget. A state health officer has to prove to his office that the use of a drug is warranted. Acetarsone, in the current market, costs five times the amount of the equivalent therapeutic quantity of sulpharsphenamine. It is possible that its use in greater quantities might reduce the "per dose" cost.

(5) Is its use as controllable as that of others?

Herein lies the frailty of human beings. Is one sure

that the dosage prescribed is given? All of us have worked on problems where, unless we gave the dose ourselves, there existed an uncertainty as whether the response, or the lack of it, came because of the medicant or spontaneously. Most of our clinic patients are none too intelligent. It is hard to expect these mothers to be as interested in regularity of dosage, especially when the child seems to all intents and purposes well. It is regrettable that just where acetarsone would be the drug of choice, namely in rural districts, where attendance at a clinic causes a hardship, it is impracticable because of the uncertainty of administration.

I believe that the treatment of syphilis in children should be kept as simple as possible. In the Family Clinic at Johns Hopkins we have simplified drugs to sulpharsphenamine, mapharsen and bismuth salicylate. We keep tryparsamide handy and on occasions use bismarsen or neoarsphenamine when there are idiosyncrasies to mapharsen. But the three drugs first mentioned are our main stand-by and are the only ones regularly on the treatment tables.

I have used acetarsone for several years and have accumulated a considerable series of patients so treated. I agree with Dr. Arena that it is a very satisfactory drug. As I have outlined, it has its limitations. In clinic practice, where most of the congenital syphilis is, it offers no advantages over sulpharsphenamine in the treatment of congenital syphilis.

Dr. Arena (closing).—For our purposes, with the setup that we have, the drug has had its advantages and proved effective in the treatment of infants under a year of age. It seems logical to me that if more infants are returned for treatment because the drug is easily administered, then this method, since it appears effective, should not be discarded.

CIVILIAN MEDICAL CARE IN TOTAL WAR*

By THOMAS PARRAN, M.D.†
Washington, D. C.

Men and materials will win the war. To this all of us agree. We are agreed also that this war can be won only by much greater sacrifice from all of us.

Insofar as personal sacrifice is concerned, the health and medical professions have demonstrated their full devotion to duty. More than 40,000 physicians, 8,000 dentists, 30,000 nurses, and countless other technicians are now with the armed forces. But in numerous quarters I have encountered a disturbing insensibility to the professional sacrifices we are now called upon to make. There can be no more "business as usual" for any of us. That goes for the private physician and the health officer just as it goes for the huge industrial concern, the small manufacturer, the butcher, and baker.

Indeed, the time has already passed when a physician could prescribe from a free choice of the pharmacopeia; when he could secure private duty nurses for any patient able to pay for the service. The day has passed, too, when the health officer could recruit personnel with the training qualifications recommended in peacetime, or launch a special program of possible scientific interest but doubtful value.

The very nature of our work, relief of suffering and saving of lives, has bestowed upon the professions a human respect which is at once our strength and our peril. Both in the public mind and in our own thinking, there dwells the unexpressed belief that the physician, his methods and his armamentarium are somehow inviolate to changes imposed by war upon such mundane institutions as industry, organized labor and commerce. Frankly, we must straightway disabuse ourselves of this belief, and align our thought and action with reality. As a matter of fact, the practice of public health and medicine in the United States is already undergoing changes so fundamental in character and so vast in scope as to command forthwith our best professional thought in understanding them, and our wisest leadership in adjusting to them.

These changes are but part and parcel of the global economic strategy which is as much a war necessity as a successful invasion of Northwest Africa. The herculean task of procuring and processing raw materials and distributing the finished products which we and our allies need cannot be accomplished without further economic change. On the food front, for example, the Combined Anglo-American Food Board has announced an agreement providing for the exclusive purchase and allocation by the United States and Great Britain of all the fats, oils, and oilseeds available to the United Nations throughout the world, so that these essential foodstuffs may be used most efficiently. Again, 3,000 Mexican farm laborers have been sent to California to help harvest the sugar beet crop, under a joint agreement of the United States and the Mexican Government. The Secretary of Agriculture has stated that many families who are trying to farm sub-marginal tracts should be moved into fertile areas where their labor is needed in the production of essential foodstuffs. These are

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†Surgeon General, U. S. Public Health Service.

benchmarks of economic change now going on, which will increasingly affect individuals and nations as the war crisis deepens.

A year ago the predicted shortages in men and materials on the health front had not been felt. Today, nearly one-third of the nation's effective physicians are in the Army or Navy, the young able-bodied men for the most part. I confess that I find it impossible to visualize how we are to operate essential health and medical services for the civilian population should we have to meet, at the present ratio, the medical demands for an army of ten millions.

Certainly, even under present conditions, we must begin now to apply the principle of essentiality to our use of personnel and of health defense material: the drugs, equipment, and supplies. Effective operation on the basis of actual need demands a method for equitable allocation of medical manpower and supplies.

Conservation of health supplies and drugs must be practiced to the extreme limit. All of us must begin now to get along with less and even to do without things we have been accustomed to use freely. A large hospital recently reduced its consumption of rubbing alcohol by 50 per cent, without detriment to the patients. In private practice, one hypodermic needle can be made to take the place of five, by proper care and expert grinding.

On the drug front, decisions must be made now as to what medicinals are absolutely essential. Debate must be brought to an end for the duration; and balanced considerations of life and death, rather than personal preference, should determine the conclusion.

Conservation of raw materials used in the manufacture of drugs and health supplies is doubly important. On the home front, we must protect essential supplies for the thrust ahead; and we must produce enough to furnish substantial amounts to our allies and other friendly nations.

At the recent Pan American Sanitary Conference in Rio de Janeiro, it was very apparent that the Latin American nations are deeply concerned about the availability of health and medical supplies. Their stores, formerly obtained from Germany, are running out and they have not the resources to produce many essentials. The principle of "equal sacrifice" is being accepted by the United Nations and the American republics with respect to health and medical needs as well as to procurement of war materials. For example, to supply Brazil with chlorine for the protection of water supplies in exchange for rubber is not only in accord with our Good Neighbor policy, but a war necessity. Rubber we must have and Brazilian workers must have safe water.

FACILITIES AND PERSONNEL

Our situation with respect to the availability of facilities and personnel for civilian health maintenance is unquestionably more serious at the present time than our potential shortage of medical material. Later the reverse may be true.

Pooling of essential facilities must be increasingly adopted as the pressures of war increase. Many physicians unaccustomed to group practice are learning to share equipment, ancillary personnel, and even patients with their colleagues, whether or not they formerly practiced in the same hospital or belonged to the same golf club.

The shortage of hospital beds and health centers is, of course, concentrated in rural areas and in urban communities unprepared for the rapid influx of war workers and other civilians. The Federal program for the construction of health facilities in critical areas did not get underway in time to meet anticipated needs before the outbreak of war. Completion of projects has been further delayed by wartime priority allocation of construction materials to military purposes. Plans of many projects have had to be revised. We may expect some improvement in the worst areas when temporary construction is completed.

But it appears that for the immediate future and perhaps for the duration, hard-pressed communities must rely chiefly upon local ingenuity to meet the demand for hospital beds. Each community must cast about for better ways of using existing facilities.

In Washington, for example, where the shortage of beds for obstetrical cases is acute, hospitals are urging mothers to return home with their infants within a much shorter time than the average 10 to 12 days' hospitalization. It is estimated that if all hospitals in the metropolitan area were to shorten the stay of normal patients to 5 or 6 days, maternity facilities would be increased by 20 or 25 per cent.

Comparable savings must be made in other departments of general hospitals. Prolonged treatment of chronic disease cases must be curtailed, to increase bed facilities for intensive

treatment of patients in the same category and for acute cases.

Hospitals should also consider the establishment of convalescent homes, in temporary or rented quarters if necessary, to be operated by trained lay personnel under the professional supervision of the hospital.

Every available hospital bed in crowded communities should be put to use. In many hospitals, barriers have been raised against the full use of facilities by all qualified physicians. In one boom town, the terms of a will devising property and funds to the only recognized hospital, prevent all but two of the local physicians from practicing in the institution. Other physicians are obliged to send their patients needing hospital care 25 miles out of town. In another community, the local doctor is not allowed to practice in an industrial hospital, the sole facility, nor are the two industrial physicians allowed to attend patients outside the plant. Yet, any member of the community can obtain hospital care in the industrial institution on a fee for service basis. Such competition and monopoly of essential facilities are clearly detrimental to the profession and to public welfare.

The lack of professional personnel in many areas is complicated by the fact that the withdrawals into the armed forces have not occurred evenly throughout the country. It would be possible, if we were dealing with statistical abstractions, to draw 55,000 physicians out of practice and still leave one doctor for every 1,420 civilians, not an unreasonable load. Unfortunately, we are not dealing with abstractions. Total war is a sharp reality.

To illustrate: In a west coast military-industrial area, the population has doubled since 1940; the ratio of physicians to patients has changed from one per 1,000 to one per 4,000. In an east coast industrial center, employing some 40,000 workers, the ratio has jumped from one per 2,150 to one per 4,350. The only doctor under 65 years of age has left the area. In another military zone, only two men under 65 are left, and the ratio of physicians to population is now one per 3,500. And in a Southern boom town, the only doctor has been inducted, leaving the "ratio" zero to 6,000!

Two years ago, another middle western community was a village of some 500 people. Today, between six and seven thousand live there. Only two physicians remain: one a young man under 45, the other nearing 70. The younger man has not been defined "essential" to the health of the community and expects induction shortly. The State Procurement and Assignment Chairman has declared him eligible for military duty. On the other hand, the local Selective Service Board has deferred five osteopaths as "essential men." The only hospital is owned and operated by the osteopaths and the two medical men are not permitted to practice on the staff. The older physician says that if the young doctor goes he will not be able to assume the responsibility because of ill health.

Up to the present time, decisions with respect to the allocation of physicians have been handled on a voluntary basis by the Procurement and Assignment Service under the War Manpower Commission. As an advisory agency, working closely in cooperation with the American Medical Association, it has rendered a valuable service. Quite recently it has accepted the responsibility of determining the civilian needs of critical areas and of helping to provide essential personnel. As yet, however, the Procurement and Assignment Service has no legal authority to draft physicians for military or civilian service nor is it in a position to deal with the financial and administrative problems involved in the provision of medical care.

The lack of medical personnel in critical areas is an urgent war problem. The Federal Government therefore has a clear responsibility to assist in its solution, since if it is not solved, it will increasingly impede the war effort. The method of meeting the needs, however, must be developed with the fullest cooperation of the medical profession. Obviously, state and local medical societies are unable to deal with many situations arising from war activities which transcend state and local lines.

Prompt and effective action to meet acute needs in 300 military and industrial areas is needed. Last spring, Mr. Channing Dooley, now with the War Manpower Commission, told a conference of industrial hygienists:

> "When you have a tough problem to solve, break it up into a lot of little problems and then solve them one by one."

In this spirit, we solve the individual community problems which in the aggregate comprise the tough assignment of providing medical service in the nation's war areas.

It has been suggested that the wartime service of every physician and nurse in the United States be allocated now by the War Manpower Commission. Under National Service legislation, such as has been proposed and discussed

in recent weeks, this would be possible. The services of health and medical personnel could be allocated more promptly and equitably than at present, and with less hardship both to individual communities and to the physicians and nurses—hardship with which the South is perhaps more familiar than any other part of the country.

From the available supply of medical, dental and nursing personnel, it would be possible to earmark certain numbers for the armed forces and leave them in their present work until actually needed. Others could be located in the areas gravely in need of medical care and could be given the facilities to render adequate services.

Medical and premedical students could be enrolled as a special category of professional manpower and, upon completion of internship, could be allocated among the Army, Navy, and civilian services. This would eliminate the present uneconomical procedure under which the Army and the Navy compete for medical students by commissioning them in numbers which later may prove disproportionate to the needs of the respective services. If the draft age is lowered to 18, it will be doubly necessary to exercise some control over premedical recruitment, for we must insure the matriculation in sufficient numbers of medical students with high physical and mental qualifications. Much depends now and will depend more after the war upon a continuing flow of young, able-bodied physicians of the highest caliber.

Even with the rationing of available professional services, greater efforts must be made to increase the supply of personnel. The enrollment of student nurses for this fall will probably reach 55,000; an increase of 20,000 over 1940. But to meet anticipated needs, we shall have to enroll 65,000 for basic training in 1943. Even with substantial Federal aid to the nursing schools, training facilities cannot meet such an expansion. In the meantime, civilian nursing needs are mounting as the graduate nurses march off to war.

In October the Health and Medical Committee approved a plan which would increase the supply of graduate nurses and meet the growing deficiency in hospital nursing services without disturbing the essential standards of nurse training or the present requirements of the state boards of registry.

The curriculum of the basic training course in the nursing schools would be speeded up for completion in 24 months; after which, third-year students would go on the payroll of the parent hospital or of affiliated institutions as apprentice general duty nurses. They would not live in the hospital, thus opening dormitories and classrooms for additional student nurses. The third-year students would not receive their certificates until the completion of three years' training, but their release in the last year would supply civilian hospitals with replacements for the general duty nurses who have been drawn into war service. The physical facilities for nurse training would be increased by one-third and hospitals would be provided with an augmented staff for ward duty.

Our medical schools will soon be turning out some 7,000 young physicians a year. The period of instruction has been shortened and the enrollment has increased. The reduction of faculties through the withdrawal of young teachers by the armed forces, however, has caused some concern. Every effort should be made to protect the essential teaching staffs of our medical schools. In our desperate demand for numbers of doctors, we must not forget that the quality of the product in medical education is vital to the war effort. We must not kill the goose that lays the golden eggs.

The protection of our organized health services is equally essential. Medical men and laymen alike must realize that when you take one public health physician you may need three private practitioners to cure the unprevented sickness.

Health departments in wartime, like private medicine, must stick to essentials and cut out the frills. Conservation of public health professional services calls for prompt reduction of unnecessary inspections, complicating record-keeping, and long-range programs of doubtful value. In one war county, the local health department has been operating a mobile unit for the sole purpose of tuberculin testing in the schools. There is no provision for prenatal or postnatal care and there are no hospital beds for obstetrical cases. Rationing of civilian use of gasoline and tires makes it impossible for most of the women to reach the health department. Better use of mobile equipment, in this case, might have been made by establishing a traveling maternal and child health clinic.

Both in public health and medical services, greater use must be made of lay personnel who have been carefully selected and trained to do a particular task under professional supervision.

Hospitals are drawing more and more upon the nurses' aides trained during the past year, and the Red Cross anticipates that in 1943, 100,000 women will receive this training and a million will be given instruction in home nursing. Recently, state health departments in cooperation with the Public Health Service have employed some 500 laymen and put them to work at tracing contacts of venereal disease patients. In one state, private physicians are training housewives, school teachers, and social workers as midwives. Reports of professional observers from all these projects indicate that results have been excellent.

As the winter approaches, with prospects of a fuel shortage and overcrowding in many cities, there has been a growing public concern lest an epidemic like the visitation of influenza of 1918 strike us. At the moment, there is no scientific evidence which would warrant such an assumption, but no one can safely predict that we shall escape. This expressed epidemic-consciousness may be the symptom of an underlying anxiety roused by the loss of many doctors and nurses from civilian service. As physicians, we know that the toll of undramatic ailments, lowered resistance, and neglect of health is likely to be far greater than the explosive damage of an epidemic. Ours is the heavy task of minimizing the slow depletion of national strength.

To the life-saving forces of our profession belongs the leadership of constructive effort both now and after the war. We must show ourselves responsible to merit that leadership by directing our whole capacities to the demonstrated needs: by extreme conservation of supplies and drugs; by full sharing of available facilities; and by patriotic acceptance of the sacrifices imposed upon all peoples in total war.

The major health problems are still ahead of us. Increasingly, the home front will feel the pressure of war. The sharp realization that this is indeed the civilian's fight as well as the soldier's will grow as problems of production and manpower mount. We must be ready to meet the incalculable demands with our remaining professional force. There must be no medical Bataan on the home front. Only the wisest use of our resources and the utmost devotion to the common cause will suffice.

DISCUSSION (*Abstract*)

Dr. A. T. McCormack, Louisville, Ky.—Dr. Parran has presented to this group the problems which confront our Government and people in the best utilization of the medical and its allied professions and vocations during this total war. It is particularly fitting that this address should have been delivered before the Section on the General Practice of Medicine, because the general practitioners constitute the only group which has the opportunity to secure the overall picture of the need for medical care. I am afraid, frankly afraid, of the primary aim of medical education today, namely: the undergraduate education of specialists as a substitute for the older program of education and development of physicians. It is unfortunate that the foundation group in medical personnel, the general practitioner, is conspicuous in contemporary medical education only by its absence from the roster of medical school faculties.

Throughout its history, our profession has so built its procedures as to be responsive, in the main, to the demand of the sick or injured for medical service. During all this time we have recognized only the need for medical service, as distinguished from demand, only during the war, pestilence or great national disaster when we have found ourselves mobilized incidentally by the drama or tragedy. The mere presentation of the problem by Dr. Parran challenges us as to whether the medical profession can so organize itself as to respond to the needs of the human race for the prevention, amelioration or arrest or cure of the causes of ill health or whether it will be necessary for organized society to undertake the task of utilizing the profession as it does its other civil servants. The very presentation of the problem immediately incites us to wrath and then to anxiety. We know that in America we have the best educated and best qualified medical profession in the world today. We know we have more doctors per capita than anywhere else. We have better health conditions and longer life than in any other continent. We doctors have been satisfied to preserve the status quo except where we have been prodded by other organized human groups interested in the preservation of their own health to experiment with prepayment plans for illy assorted group practice. It was apparent to the thoughtful members of the profession that most of these plans were either actuarially, economically or scientifically unsound, and their development has resulted in a delaying action that makes more pressing every day the dilemma that confronts us, that we must either organize our profession to be responsive to human needs or it will be done for us or with us.

Organized society has been quick to see the need for medical care for our armed forces. Our Army and Navy are provided with a greater proportion of medical personnel than any other group of humanity has ever had. Of course, this is as it should be, but we must remember that they are the healthiest group of men that has ever been assembled. They are well fed, have regular hours, except when on the battlefield, have organized recreation and the very best type of exercise for the development of physical fitness. Remembering that there are fewer casualties amongst the armed forces in modern war than there are in the homes, factories, farms and roadsides of our country, what should be

our duty toward the discrepancy between the preventive medical care given to our disciplined and protected soldiers and sailors and our large groups of those who work on farms, in factories, offices and stores? Looking at the needs of the world after we have won the victory, which is inevitable, is it not quite as important that the mothers and babies of today, the children and men and women of tomorrow, shall have such medical care that the disabilities and unnecessary accidents and diseases that make at least a quarter of our people unavailable for use in war or peace, shall be corrected? It outrages any thoughtful person that half of our selectees are found with defective teeth, when we have the most capable and best trained dentists in the world. Every physician can be outraged by the lack of dental care. Can we not then realize that many other thoughtful citizens will be finding themselves equally outraged that preventable diseases in our mothers and babies and infants and preschool children and school children and adolescents and mature men and women are permitted to continue when we have the knowledge and only need the increased personnel and facilities to control them all?

My friends, it behooves us, the physicians of the South, to keep not only in our own minds, but before the minds of our people, the fact that agriculture is the basic industry without which organized society is useless and hopeless. When the Founding Fathers freed this country to embark on the great adventure of liberty in a democracy, we had practically no cities and no factories or industries of any kind. The farmers of this country have built and paid for its cities and its factories, and were they all destroyed tomorrow they could again rebuild them, but if the farms are destroyed those who work in factories and our urban population would starve and die of pestilence as we see them starving and dying of pestilence in those countries which have failed to heed this evident historical fact. Our profession must help to preserve the farming population of the South. We cannot keep the fathers and mothers of our children on the farm when they know they can have their children educated, clothed, housed and better cared for in sickness and in health in the town or factory than in the farm home.

During the recent sessions of its house of delegates, these problems were presented to the medical profession of Kentucky and they responded unanimously, setting up an organization which has the power to respond to demonstrated needs of medical service in any section of the State under the supervision and direction of the local profession. The younger men in the profession, upon whom the burden of medical care will rest tomorrow, must respond to the questions raised by Dr. Parran's thoughtful problem-provoking address wisely, if we are either to deserve or preserve liberty of action by the profession. May the Great Physician guide us that we may be able, through His sustaining strength, to the end that we may continue to control, with the consent of all our people, the house of medicine. We should definitely know that we can do this only if we set ourselves the task of providing such medical care as will meet the needs of our people for the prevention, amelioration and cure of accidents and disease, insofar as this is humanly possible.

PERSONNEL PROBLEMS OF THE MEDICAL DEPARTMENT*

By GERALD H. TEASLEY, M.D.†
Washington, D. C.

The Personnel Service of the Medical Department has a tremendous problem in securing adequate medical care for our armed troops. If this were the only obstacle, its accomplishment would be comparatively easy, but this is not the case in that the Medical Department must not be considered alone. It is an integral part of medical care of the nation as a whole and every plan must be based upon the needs of the entire nation. Adequately to supply the Army with medical care and leave civilians without the necessary physicians, would be a mistake as great as having too few medical officers for the Army.

Thus, when the Medical Department procurement objectives are finally decided, civilian needs are included in the basic plan. Civilian medical care must be maintained, perhaps not on the same level as before December 7, 1941, but definitely on a level adequate to care for necessary medical conditions. Our figures must include the expected loss in personnel each year in civilian and military life.

In order to assist the Surgeon General in making plans for 1943 and following years, a letter was recently addressed to various medical schools and hospitals throughout the country. This letter was not a directive and did not represent any policy already adopted, but was an explanation of certain ideas which have been developed in the office of the Surgeon General. It was an effort to secure comments and suggestions from hospitals and schools for ideas which might be incorporated into the overall program, which would result in better distribution of medical care both in civilian life and the Medical Department of the Army. The ideas of this suggested plan are predicated upon the fact that all physicians are of infinitely more value as such than as inductees in the Army. Every man of proper age group faces action by Selective Service System Headquarters according to military needs. But we do not wish our interns to be inducted, and therefore, as explained

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in the letter, agreements have been reached with national headquarters of the Selective Service System whereby the local boards will be contacted and requested not to call these individuals to duty. We must remember, however, that the local board is free to function as it sees fit. Additional measures to protect our physicians from call are maintained through appointment of students as officers in the Medical Administrative Corps, and also through appointments which they earned upon the completion of Reserve Officer Training Corps courses in various colleges.

Those interns who do not hold commissions in the Army and are graduates of approved schools, were given the opportunity of securing commissions while they were medical students. If they chose not to secure commissions, they are in the group who must face the possibility of induction by their local draft boards. It is these men whom we are trying to defer through agreement with the National Headquarters of the Selective Service System. The original plan of appointing students as officers in the Medical Administrative Corps was promulgated with the idea of establishing a pool of physicians in civilian life who could be called upon at the time of military need. If our medical students would cooperate wholeheartedly with this program and apply for commissions in the Medical Administrative Corps while students, the problem of induction of younger physicians would immediately disappear. In addition, the Surgeon General would be in a better position to assist various hospitals and schools in making intelligent decisions concerning the deferment of essential residents and interns in various hospitals.

The total number of students who graduated in 1941 was 5,398. Of that number, approximately 30 per cent were physically disqualified, which should leave approximately 3,679 physicians available for military service. However, our figures indicate that 1,271 physicians, definitely in the military age group, have not yet signified their intention of serving their country. These men are of tremendous value to the military service in that our urgent need now is for younger individuals; men who can adequately meet the arduous field work necessary in supporting our tactical units.

The letter referred to above mentioned that cooperation and planning must be continued between hospitals, schools, the state examining boards for medical licensure, the War Manpower Commission, and the office of the Surgeon General. To coordinate our program, it is believed that the length of formal training for specialties following graduation must be curtailed during this present emergency. However, the twelve months' internship now required should be continued. This immediately foreshadows a complication which will develop in the graduation of a class in April, 1943. These graduates should be used immediately as interns in order that they may complete twelve months' training at the earliest possible date. The interns whom they replace should be utilized as sub-residents until they complete their necessary internship, after which they will be available for military duty, as residents, or as active civilian physicians. Previous policies were to allow eighteen months in which to complete twelve months' internship. It is not felt wise to continue this in view of the fact that all graduates can receive the necessary twelve months' training in one year from the time of graduation by proper coordination of hospital and school program. This will allow the distribution of these physicians at an earlier date than had originally been planned.

The suggestions made in this letter have been very favorably received according to answers from various sections of our country. In fact, many hospitals have already made plans for such a change in their 1943 intern program. It seems that every possible effort is being made to cooperate with the Medical Department and it is urged that this will continue. It is hoped that more thought will be paid to the placing of individuals in the essential group from this, since only those who are physically disqualified for military service or are above 45 years of age should be so classified. These men should be the ones utilized as residents in the hospitals and civilian physicians throughout the nation.

By press and radio, the medical profession has been given more publicity recently than it has ever experienced. We have been informed of the fact that the need for the physicians is continuing both in the Army and in many civilian communities. With the expected expansion of our armed forces in 1943, many thousands will be added to those already in the Medical Departments of the Army and Navy. By judicious utilization of the various abilities of these doctors, it is thought that all future expansions can be adequately cared for by maintaining a definite level, a few thousand above this year's allotment. By proper coordination with the War Manpower Commission, it is planned not to interrupt essential civilian needs

which include the teachers so necessary in our approved medical schools. At no time has it been thought possible to commission more than one-third of the available physicians in the armed forces, since the others must be available for civilian medical needs, which will continue at all times.

As we recognize the fact that procurement of medical officers must continue, it is thought that an explanation of the manner of securing commissions should be discussed and that we should answer a great many questions in the minds of doctors throughout the nation. The states represented in the Southern Medical Association have more than satisfied the 1942 quota as determined by the War Manpower Commission, but some states will be called upon for additional doctors in 1943. All available physicians will be so classified by the State Chairman of the Procurement and Assignment Service of the War Manpower Commission. That individual will be contacted by the Officer Procurement Service of the War Department and the application completed. No commissions will be tendered except through the office of the Adjutant General in Washington.

All applications are sent directly to the Surgeon General and are reviewed by the Personnel Service, for an addition to decisions concerning grade, it is the duty of the Personnel Service to make recommendation for the initial assignment. It is recognized that much better professional care will result from proper assignment of physicians to work for which they are trained. An effort is made to determine the professional background and training of the individual, both from his own record and other sources of information available to the Surgeon General. The proper choice of station assures our soldiers of expert attention and, in addition to that, aids the physician in maintaining continued interest in his work. It is impossible to assign all individuals to the type of work which they have been accustomed to doing, since military needs must supersede all others in regard to medical officers and their assignments. The tactical units are for field duty only, and, as such, do not maintain hospital care for the soldiers. The duty of the medical officer attached to these units requires much more than professional care. The individual must be well acquainted with the tactical mission of his troops and so plan the medical program that his men will at all times receive the necessary emergency medical care before being transferred to hospitals. It is in this type of work that we find an urgent need for our young, physically qualified physicians, for upon them will fall the burden of maintaining the functions of the Medical Department in field work which is essential to the proper functioning of rear echelon.

In regard to the age group mentioned above, it is interesting to note that in a recent issue of the *Journal of the American Medical Association* a statement is made concerning British physicians who are called to active duty only in the age group below 41 years. It is evident from this that the British Army has recognized the need for younger physicians. The action of our own Congress recently in extension of the Selective Service System to the men of the 18 and 19 year old age group reveals to us that this is a young man's war. Such a move by Congress should be followed by a corresponding increase in the number of applications received from younger physicians to coincide with draft boards' call to younger men to the armed forces.

It is felt that many doctors have not yet volunteered their services to their country who will apply in the future. Perhaps they have not yet recognized their responsibility to our nation and the need for physicians in the Army. Or perhaps certain personal problems have demanded their presence at home. As an aid to these men who will apply in the future, a plan is under way whereby men can be commissioned in the Army of the United States, but allowed to remain at home until they can be placed in certain definite assignments. These men will be called to duty approximately three months after they have been commissioned as medical officers. With such a plan an individual can know definitely when he will be called to duty. This will give him an opportunity to take care of many personal affairs which would not be done if he were ordered to duty suddenly. It also gives more opportunity for proper rearrangement of physicians in civilian areas. This should be of distinct advan-

tage both to the Personnel Service and to individuals who are now physicians in civilian life.

In reading and answering thousands of letters which come to the Surgeon General each week, one cannot help being impressed by the marked patriotic interest of physicians in the older age groups. They recognize the fact that only by complete cooperation and mobilization of the medical effort can we be successful in our war aims. Their requests for active duty are made in no uncertain terms, but unfortunately, the demands of the military effort are such that many of these men cannot be utilized. They can best serve their country by taking care of civilian medical needs at home, for if they leave some younger individual will probably be classified as essential and thus kept from serving. The older men should make an effort to convince the younger physician that he is the one who should volunteer his services and leave the care of civilians to those who are physically disqualified or in the older age group.

With the responsibilities for the health of our nation, which we accept upon completion of our medical training, we must meet this problem and master it. To preserve the traditions of our profession confronting us, we cannot allow this to be done by force. This should be accomplished by voluntary application for commission, and we expect it to be done in this manner. The returns are too great in future benefits to the younger physician for him to shirk this responsibility. It is our problem as part of the national war effort to complete the job we have begun.

DISCUSSION (*Abstract*)

Dr. Jacques P. Gray, Richmond, Va.—Two weeks ago, at the Louisville meeting of the Association of American Medical Colleges, representatives of both armed services commented on the important problem of continued supplies, not only of physicians recently and soon to be graduated from approved medical schools, but also of medical and premedical students. The maintenance of such supplies will be particularly difficult, henceforth, because of the amendments of the Selective Service Act affecting men of 18 and 19 years of age. At that time (two weeks ago) reference was made to the possibility of the creation of a new corps, to be known as the Enlisted Training Corps, for premedical, predental, and other pretechnical and pre-professional men.

May I ask Major Teasley if he has any further information on this possibility or on the situation? The statement was made in Louisville that we would have some definite information on the subject in about two weeks, but I have not had it up to this time.

ACUTE HEMOLYTIC ANEMIA IN FERTILIZER WORKERS*

A NEW INDUSTRIAL HAZARD

By ROBERT WILSON, JR., M.D.†

and

GEORGE H. MANGUN, PH.D.‡

Charleston, South Carolina

Acute hemolytic anemia is not a common industrial accident. Most of the reported cases[1] have occurred in chemical and galvanizing works, usually in some stage of the industrial recovery of certain metals. However, within the past 3 years we have encountered 3 cases of acute hemolytic anemia with hemoglobinuria, all of which occurred under similar circumstances in the fertilizer industry. The unusual nature of these cases has led to certain investigations which we believe clearly point to a metallic poisoning, an industrial hazard previously unsuspected in the fertilizer industry.

As a source of ammonia nitrogen, fertilizer plants use a great deal of fish-scrap obtained from menhaden fish. The fish are caught in the Atlantic in nets; they are taken to a processing plant where they are steamed for a few minutes and the oil pressed out. The remaining scrap is dumped into the hold of a wooden schooner and usually lightly acidulated by sprinkling with sulphuric acid. The hold is tightly closed until the ship arrives at the fertilizer mill, when the hatches are opened. At times a canvass blower tube headed into the wind is used to ventilate the hold, but often merely opening the hatches is thought to suffice. Negro laborers are sent into the hold where they load the scrap in tubs and these are transported in carts from the ship to the mill. Apparently it is the custom to send the uninitiated workman farthest down into the hold, where ventilation is the poorest. As none of our patients had worked with fish-scrap before, all were sent into the deepest recesses of the ship.

CASE HISTORIES

Case 1.—N. H., a 28 year-old Negro man, was admitted to Roper Hospital on September 22, 1939, with

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a story of headache, vomiting, and the passage of red-colored urine. The day before admission he had worked aboard ship at one of the local fertilizer mills unloading a cargo of fish-scrap; he had been perfectly well until undertaking this work and ascribed his illness to exposure to the fumes inhaled while working in the hold of the ship. Although feeling badly, he was able to continue work through the day, but during the night developed severe and persistent headache, became nauseated and vomited some dark fluid, and noticed that the urine was deep red in color. His symptoms continued without remission until he came to the hospital late in the following afternoon.

On physical examination some pallor was noted and the sclerae were thought to be slightly icteric. He was quiet, in no pain, and breathing easily. The blood pressure was 170/120. There was generalized enlargement of the lymph nodes; for the rest, examination was entirely negative.

Shortly after admission to the hospital the patient passed some urine of the color of port wine, which contained a large amount of protein, but no appreciable number of red blood cells; subsequent chemical examination confirmed the suspicion of gross hemoglobinuria. This condition persisted for almost six days, after which it began to clear, and 3 days later he was discharged from the hospital with a normal urine. A slight transitory icterus developed, and there was moderate subjective weakness due to anemia, but these disappeared after blood loss had stopped. Treatment was purely symptomatic, and, although it had been planned to give the patient a transfusion, a suitable donor could not be immediately obtained and iron was prescribed for his anemia. After leaving the hospital the patient continued to improve and when last seen (May 1942) he had had no recurrence of his trouble. However, he had not worked again with fish-scrap in any capacity.

Laboratory Examinations.—The urine was negative except for the presence of hemoglobin in large amounts, and subsequently this cleared completely. The initial blood count showed 11 grams of hemoglobin, 3,930,000 red blood cells, 12,200 leukocytes; 4 days later the hemoglobin had fallen to 5.5 grams, the red count to 1,920,000. Several blood smears were negative for the presence of malarial organisms. No sickling of the red cells was noted in a suitable preparation. The blood Wassermann reaction was negative. The Donath-Landsteiner test, performed after the blood serum had cleared, was likewise negative. The fragility test showed no increase in the fragility of the patient's red blood cells to hypotonic salt solution.

Case 2.—B. P., a 31-year-old Negro man, was admitted to Roper Hospital on November 30, 1941, with a story of abdominal pain, dizziness, and the passage of red urine. Four days previously he had worked all day unloading fish-scrap; that night he had become ill with dizziness, later with abdominal cramps, and the urine was seen to be red in color. The following morning the patient tried to return to work, but was able to continue for only a few hours, when he had to stop because of his symptoms and because of the development of moderately severe shortness of breath. He then went home to bed, where he remained until entering the hospital 3 days later. His history was otherwise negative. On physical examination the only positive findings of significance were pallor of the mucous membranes, definitely jaundiced sclerae, and generalized tenderness and rigidity of the abdominal wall.

As soon as the first specimen of mahogany-colored urine was obtained, the diagnosis of gross hemoglobinuria was established by its examination. Alkali and fluids were given by mouth, glucose and salt solution by vein, and 2 transfusions were given during the first 3 days of hospitalization. An adequate urinary output was maintained and the patient made a prompt symptomatic recovery. The urine gradually became lighter in color, but contained hemoglobin until December 4, 8 days after his first exposure to fish-scrap. Thereafter, the urine remained clear. The jaundice diminished progressively, the patient's strength returned, and he was able to be discharged from the hospital exactly 14 days after admission. Since that time he has reported to the Out Patient Department on a number of occasions and has remained in good health.

Laboratory Examinations.—The urine was of a dark mahogany color, contained a large amount of protein, and the chemical test for blood was strongly positive; there were no red cells in the sediment. The blood Wassermann test was negative. Several smears for plasmodia were also negative. On the day after admission the carbon dioxide combining power of the blood was 66 volumes per cent. On the same day, the pH of the blood serum was 7.82 and the next day 7.50. The fragility test showed some increased resistance of the patient's red blood cells to hypotonic salt solution; hemolysis began at 0.44 per cent salt solution, was not complete at 0.12 per cent, while in the control hemolysis began at 0.44 per cent and was complete at 0.30 per cent. Blood counts and other laboratory results are shown in *Table 1.*

Case 3.—A. D., a 45-year-old Negro man, was admitted to Roper Hospital on December 1, 1941, with a chief complaint of abdominal pain of 2 days' duration. He had been employed at a local fertilizer plant and on 4 days, November 26 to November 29, he had worked at unloading fish-scrap from a boat at the mill. The patient had had some dizziness and slight shortness of breath on exertion for 2 days, but did not become acutely ill until the evening of November 29, when he was seized with violent generalized abdominal cramps, followed by a severe chill and the passage of dark red urine. Throughout the next day the abdominal pain continued and the urine was persistently dark in color; headache, nausea and weakness appeared and hospitalization was sought 2 days after onset. The remainder of the history was negative. On physical examination there were no findings of note except for pallor, icteric sclerae, and generalized rigidity and tenderness of the abdominal wall.

The diagnosis of acute hemolytic anemia with hemoglobinuria was confirmed by urinalysis. Due to a mistaken order alkali was omitted, but the patient received large amounts of fluid by mouth and by vein, and 3 transfusions of citrated blood were given on the second, fourth and seventh days in the hospital. On December 4 complete anuria developed, which lasted for 3 days despite an adequate fluid intake. Nitrogen retention quickly developed, the patient became lethargic and later lapsed into coma. Jaundice persisted, nausea and vomiting appeared, and although

some urine was passed after 3 days of anuria, the patient succumbed with clinical uremia.

Laboratory data are summarized in *Table 2*. The urine contained a large amount of protein, a few casts, no red blood cells; chemical test for blood was strongly positive. The blood Wassermann test was negative. Two smears were negative for plasmodia. The carbon dioxide combining power of the blood plasma was 58 volumes per cent. On the day after admission the pH of the blood serum was 7.63, of the plasma 7.78. The fragility test again showed some increased resistance of the patient's red blood cells to hypotonic salt solution; hemolysis began at 0.46 per cent salt solution, was not complete at 0.12 per cent, while in the control the limits were 0.44 per cent and 0.30 per cent.

Autopsy was performed 14 hours after death; significant findings were confined to the kidneys. Their combined weight was 480 grams. They were slightly enlarged and the cortical surfaces were somewhat mottled. The most noticeable feature on gross inspection of the cut surface was the presence of dark striations of the papillae. Microscopic examination showed almost all of the collecting tubules blocked by hemoglobin casts, with dilatation of the tubular system proximal to the site of blockage and in some fields there was a dilatation of Bowman's capsular spaces and an acidophilic protein coagulum deposit. There was also an associated active and chronic inflammatory infiltration of the intertubular medullary stroma.

DEMONSTRATION OF HEMOLYSINS

The demonstration *in vitro* of hemolysins in the blood serum of patients suffering from acute hemolytic anemia has been accomplished by Chauffard and his collaborators,[2] by Dameshek and Schwartz[3] and others. These investigators have noted the hemolytic activity of the serum

LABORATORY FINDINGS IN *CASE 2*

Date	Hb. (Grams)	R.B.C. (mils)	W.B.C.	Plasma Hb.	Urea N.	Urine Color
11-30	4.0	2.08	19,100			Black
12-1	3.25	1.72	21,750	1.4	29 mg.	Black
12-2	3.25	1.42	25,250	0.6		Red-brown
12-3	3.25	1.13	12,300	0.2	28	Red-brown
12-4	4.0	1.41	9,525	0.0	16	Light brown
12-5	4.5	1.89	6,350		9	Light brown
12-6	5.0	2.40	7,100		13	Straw
12-8	6.0	2.86	7,425		9	Light Brown
12-13	8.0	2.91				
12-26	10.0	4.45				

Table 1

LABORATORY FINDINGS IN *CASE 3*

Date	Hb. (Grams)	R.B.C. (mils)	W.B.C.	Plasma Hb.	Urea N.	Urine Output	Urine Color
12-1	8.5	3.96	19,100				Black
12-2	5.0	1.62	41,350	1.0			Reddish black
12-3	5.5	2.99	32,100	0.2	99 mg.	900 c. c.	Reddish black
12-4	4.0	3.00	23,000	0.1	155	0	
12-5	4.5	2.34	9,000	0.0	224	0	
12-6	4.5	2.20	6,500		285	0	
12-7	3.5	1.75	6,750		530	630	Yellow
12-8	4.0	2.59	9,900		488	470	
12-9	5.5	2.50	6,025		470	240	

Table 2

by direct observation of its effect on the red cells. However, in the cases here reported hemoglobin was already present in the blood serum in sufficient amounts to make direct hemolytic tests impossible. By means of the following technic, suggested by Dr. Philip L. Harris, the hemoglobin was largely separated out and it was possible to prepare solutions containing various fractions of the blood serum.

Technic.—An equal volume of saturated solution of ammonium sulphate was added to the blood serum, giving a half-saturated solution, with precipitation of the globulins. This precipitate was centrifuged and the supernatant fluid decanted. The precipitate was then taken back into solution in the smallest possible volume of physiologic saline. This procedure was repeated a second time, when the resulting solution was clear. The solution of the protein precipitate was then dialyzed against normal salt solution, and tested for hemolytic activity.

All of the various fractions thus obtained were tested for hemolytic activity against washed suspensions of the patient's own red blood cells, and also against red cells from another individual of the same blood group. None of the fractions showed any hemolytic activity except the redissolved precipitate which had been dialyzed against salt solution to remove the ammonium sulphate. The results of these experiments, carried out on the blood serum of the first patient taken the day of admission to the hospital, are shown in *Table 3*. The active hemolytic agent was contained in the protein (globulin) fraction of the blood serum and was not dialyzable. Its activity was inhibited by the presence of ammonium sulphate. It was present in high concentration. Complement was unnecessary for its action, and its activity was destroyed by heating to 56° for 2 hours.

Using the same technic blood serum taken from *Case 2* five days after onset and from *Case 3* six days after the patient's first exposure and four days after the onset of symptoms was tested for the presence of hemolytic activity, but none was demonstrated.

Demonstration of hemolysins in the urine has been reported by Dudgeon[4] in cases of blackwater fever; in a number of the cases studied, using alcohol and acetone extracts of both urine and body tissues, hemolysins were reported found. In the last 2 of our cases the urine was investigated for the presence of hemolysins by the same kind of technic as that used in the studies on the blood serum. About 400 c. c. of urine was obtained; the protein was precipitated by half saturation with ammonium sulphate, the precipitate redissolved in 1/10 of its original volume of salt solution and dialyzed against normal salt solution. In *Case 2* no hemolysin was found. From the urine of *Case 3*, however, there was obtained a solution of protein (pH 7.25) which had a remarkably active hemolytic effect against all types of washed red blood cells.

RESULTS OF HEMOLYTIC TESTS WITH SERUM FROM *CASE 1*, AFTER PRECIPITATION WITH AMMONIUM SULPHATE, RESOLUTION, AND DIALYSIS

Serum Dialyzate	Washed Red Cells		Hemolysis
1 c. c.	Patient	Complement	+ + + +
1 c. c.	Normal	Complement	+ + + +
1 c. c.	Patient		+ + + +
1 c. c.	Normal		+ + + +
0.5 c. c.	Patient		+ + + +
0.1 c. c.	Patient		+ +
1 c. c. (56°, 15 min.)	Patient		+ + + +
1 c. c. (56°, 2 hrs.)	Patient		No hemolysis
1 c. c. (56°, 2 hrs.)	Patient	Complement	No hemolysis
1 c. c.	Patient	Complement NH_4Cl	No hemolysis
Normal controls			No hemolysis
Serum (not dialyzed)			No hemolysis

Table 3

By the time this solution was prepared the patient had died, and no tests could be made against the patient's own cells. The results of experiments with this hemolysin are recorded in *Tables 4* and *5*. The hemolysin was contained in the protein of the urine and was not dialyzable. It was present in high concentration and complement was unnecessary for its activity. After heating to 56° for 2 hours its activity was not destroyed, but complement (guinea pig serum) and normal blood serum and plasma would then inhibit its hemolytic activity. In larger amounts normal blood plasma inhibited the hemolytic effect of the unheated extract,

RESULTS OF HEMOLYTIC TESTS WITH URINE FROM *CASE 3*, AFTER PRECIPITATION WITH AMMONIUM SULPHATE, RESOLUTION OF THE PRECIPITATE IN 1/10 ORIGINAL VOLUME, AND DIALYSIS

Urine Extract	Washed Normal Cells		Hemolysis
0.5 c. c.	0.1 c. c.		* * * *
0.5 c. c.	0.1 c. c.	Complement 0.1 c. c.	* * * *
0.5 c. c. (56°, 15 min.)	0.1 c. c.		* * * *
0.5 c. c. (56°, 15 min.)	0.1 c. c.	Complement 0.1 c. c.	* * * *
0.5 c. c. (56°, 2 hrs.)	0.1 c. c.		* * *
0.5 c. c. (56°, 2 hrs.)	0.1 c. c.	Complement 0.1 c. c.	No hemolysis
0.5 c. c. (56°, 2 hrs.)	0.1 c. c.	Normal serum 0.1 c. c.	No hemolysis
0.5 c. c. (56°, 2 hrs.)	0.1 c. c.	Patient's serum 0.1 c. c.	No hemolysis
0.5 c. c. (56°, 2 hrs.)	0.1 c. c.	Serum (56°, 15 min.)	No hemolysis
0.5 c. c. (56°, 2 hrs.)	0.1 c. c.	Serum (56°, 2 hrs.)	No hemolysis
0.5 c. c.	0.1 c. c.	Normal plasma 0.2 c. c.	No hemolysis
0.5 c. c. (after ether extraction)	0.1 c. c.		* * * *
0.5 c. c. (after ether extraction)	0.1 c. c.	Normal plasma 0.2 c. c.	* *

Table 4

RESULTS OF HEMOLYTIC TESTS WITH URINE FROM *CASE 3*, AFTER PRECIPITATION WITH AMMONIUM SULPHATE, RESOLUTION OF THE PRECIPITATE IN 1/10 ORIGINAL VOLUME, AND DIALYSIS

Urine Extract	Washed Normal Cells	Hemolysis
0.5 c. c.	0.1 c. c.	* * * *
0.5 c. c. (diluted with normal saline 1-16)	0.1 c. c.	* * * *
0.5 c. c. (diluted with normal saline 1-32)	0.1 c. c.	* * *
0.5 c. c. (diluted with normal saline 1-64)	0.1 c. c.	* *
0.5 c. c. (diluted with normal saline 1-128)	0.1 c. c.	*
0.5 c. c. (diluted with normal saline 1-256)	0.1 c. c.	No hemolysis
0.5 c. c. (diluted with physiologic buffer 1-4)	0.1 c. c.	* * * *
0.5 c. c. (diluted with physiologic buffer 1-8)	0.1 c. c.	* * *
0.5 c. c. (diluted with physiologic buffer 1-16)	0.1 c. c.	* *
0.5 c. c. (diluted with physiologic buffer 1-32)	0.1 c. c.	*
0.5 c. c. (diluted with physiologic buffer 1-64)	0.1 c. c.	No hemolysis

Table 5

but not after the solution of hemolysin had been previously extracted with ether.

DISCUSSION

When the first of these 3 cases came under observation, we were at a loss to explain just how exposure to fish-scrap had brought about the episode of acute blood destruction. Extracts of both dried and fresh fish-scrap had no hemolytic effect on either the patient's own red blood cells or on other red cells, and neither the addition of blood serum nor of complement to preparations containing these extracts resulted in any change in their hemolytic activity. However, when the last 2 patients were admitted to the hospital within a day of each other, poisoning by arsine was suspected as the cause of the hemolytic syndrome and subsequent chemical examination of the urine in both of these cases showed the presence of arsenic in large amounts. Arsenic is present in fish-scrap and is a frequent contaminant in commercial sulphuric acid. The atmospheric conditions within the closed hold of a schooner and the bacterial activity of the scrap would favor reduction reactions, and inadequate ventilation before workers were sent into the hold would preclude the possibility of sufficient oxidation to render the atmosphere innocuous. Unfortunately, actual demonstration of arsine gas in the atmosphere of the hold of a ship has been impossible, as the present situation in the Atlantic has disrupted the industry to such an extent that no more ships have been available for investigation. However, because of the facts already cited and because of the typical course of the illness in all patients, we believe very definitely that arsine was responsible for the development of the hemolytic syndrome and was the cause of death in the 1 fatal case.

Arsine has long been known to be highly toxic to man. The gas, AsH_3, was discovered in 1775 by Scheele; it is primarily an hemolytic agent and its effect on the body is largely the result of an acute and extensive destruction of red blood cells. The first known fatality[5] occurred in 1815 when Professor Gehlen of Munich died 10 hours after inhaling a quantity of the gas in his laboratory. The first industrial poisoning was reported[5] in 1873, and most of the cases reported since that time have accidentally occurred in some stage of the industrial recovery of metals due to contamination of the ore with arsenic. Cases have also been reported on submarines[6] and in the preparation of hydrogen for balloon inflation.[1] Blumer and his collaborators[5] have described a group of rather mild cases of chronic arsine poisoning among workers employed in the cyanide extraction of gold; in this series there were no fatalities, no hemoglobinuria, and the chief effect of the gas was in producing a rather profound anemia and icterus. Firket[7] reports 14 cases occurring accidentally in the industrial recuperation of cadmium, 7 of which were fatal. In all of the severe cases there was hemoglobinuria. In one of his cases the initial symptoms were followed by anuria and death in uremia; autopsy showed the kidneys engorged with blood, histologic dilatation of the tubules, and deposits of coagulated blood in the tubules and glomerular tufts. This case, both in its course and pathologic findings, was very similar to *Case 3* in our group described above.

The way in which arsine causes this hemolytic syndrome is not completely clear. Arsine gas will cause hemolysis of red blood cells *in vitro*, as our experiments have shown. Wolff[8] has shown that both free hemoglobin and blood serum absorb arsine in exact proportion to their concentration of protein; that in the presence of acid arsine becomes oxidized through the catalytic effect of hemoglobin to arsenic trioxide, with $AsHO_3$ as an intermediate product; and that in the course of this reaction the hemolytic effect appears. Although arsenic was demonstrated in the urine of *Case 3* in rather large amounts, the hemolysin isolated from the same specimen of urine contained no arsenic whatsoever. In the body, after absorption through the lungs, it seems probable that the gas enters into some loose chemical combination with protein in the serum or in the red blood cell itself. One may then suppose that this combination alters the protein so that it acquires an active hemolytic property, independent of the presence of arsenic itself. The hemolysin is apparently present in the blood in the early stages of the intoxication, when it causes widespread blood destruction, and it is excreted in the urine. Such an hypothesis would explain the finding of an hemolysin in the blood of the first patient shortly after exposure to the gas, and the failure to find it in the other patients several days after exposure.

One important clinical fact illustrated by ob-

servations on this group of patients is the necessity for maintaining an alkaline urine in cases of hemoglobinuria in order to minimize precipitation of hemoglobin in the tubules of the kidney. In the one case in which this was inadvertently omitted, a fatal issue resulted.

SUMMARY

(1) Three cases of acute hemolytic anemia with hemoglobinuria have been observed in fertilizer workers, probably resulting from exposure to arsine gas.

(2) An active hemolysin was isolated from the blood of one of the patients and from the urine of another by means of a new technic which is reported in detail.

(3) Adequate ventilation of ships carrying fish-scrap would prevent the recurrence of this industrial accident.

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DISCUSSION (*Abstract*)

Dr. J. H. Scherer, Richmond, Va.—All of us are encountering more and more cases of hemolytic anemia and hemoglobinuria for which we can find no explanation. Furthermore, the marked acceleration of industry associated with the war effort undoubtedly will be followed by an increased number of cases. I understand that this is already the case. Plants manufacturing rubber boats are finding it necessary to guard against hemolytic anemias from arsine poisoning.

While arsine poisoning is known to give rise to hemolytic anemia, few of us give this poison consideration in working up our cases. Up to the present, discussion of the relationship of arsine to hemolytic anemias has been left largely to textbooks on toxicology. Dr. Wilson's case studies will do much by way of stimulating hematologic interest in arsine.

I was interested to note that transfusions did not seem to play any important part in the treatment of Dr. Wilson's cases. The cases which did not get transfusions got along as well or better than those receiving transfusions. Although transfusions are widely used in treating hemolytic anemia, it is my impression that they usually do more harm than good. This is especially true where there is hemoglobinuria, the hemoglobinuria increasing following the transfusion.

Dr. Everett A. Livingston, Gibson, N. C.—I want to ask Dr. Wilson why it would not be of value first to bleed these patients and then to give very large transfusions of blood.

Dr. William H. Kelley, Charleston, S. C.—Dr. Wilson's cases provide another example of acute hemolytic anemia due to chemical poisoning. My impression is that they are rather similar to those due to the sulfonamides, from a clinical viewpoint. From a recent review of our cases of the latter, it appears that there are at least three potential hazards to life. If massive blood destruction occurs quite rapidly, shock as from blood loss may follow. Secondly, potentially toxic amounts of potassium salts are liberated from the lysed erythrocytes. Finally, there is diffuse obstruction of renal tubules from precipitation of hemoglobin. When shock occurs it would seem wise to employ transfusions or possibly plasma infusions. While there is no direct evidence to support the view, it would appear rational to avoid the use of potassium salts for alkalinizing the urine. Moreover, it is probably wise to give sodium bicarbonate routinely in order to reduce the acidity of the urine as a precautionary measure during the administration of the sulfonamides.

Dr. Wilson (closing).—Dr. Scherer's point as to the danger of transfusion in these patients is an interesting one. It is certainly true that as long as an active hemolytic agent is present, transfusion may lead only to further blood destruction and its consequences, and the blood would be more beneficial if given later. This brings up the question of the futility of trying to "dilute the toxins" by transfusion or by administration of fluids. Hemolysins are probably present in high concentration and could not be diluted sufficiently to render them innocuous. If they are excreted by the kidney, as would seem to be the case in the cases reported, fluid administration would be helpful in stimulating elimination of the hemolysin and not by dilution. And, as Dr. Kelley points out, it is important to keep the urine alkaline to prevent hemoglobin precipitation.

As to Dr. Livingston's question, if it were possible to do so, repeated venesection and replacement of normal blood might be very effective, but I believe it would usually be impossible from a practical standpoint.

Dr. Kelley's discussion of acute hemolytic anemia following sulfonamide therapy is quite pertinent. Although it is not proven that a similar type of hemolysin is present in these cases, the same general precautions must be observed if the patient is to recover.

CAUSES FOR UNSUCCESSFUL SULFONAMIDE THERAPY OF PNEUMONIA*

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The importance of pneumonia needs no emphasis before any gathering of physicians as, irrespective of their particular lines of medical practice, it is a disease with which we all have to deal. Within the past five years it has been established that sulfonamide therapy, properly conducted, is an effective form of treatment for certain kinds of pneumonia. Despite the proved value of this form of treatment, a number of pneumonia patients in whom these drugs are employed fail to recover. It is appropriate at this time, therefore, that we concern ourselves with the fundamental problems which this new therapy has opened and discuss some of the more important factors involved in the unsuccessful use of these compounds in pneumonia.

PNEUMONIA NOT DUE TO SULFONAMIDE AFFECTED ORGANISMS

Experience with the sulfonamides in the treatment of various forms of pneumonia has indicated that their therapeutic effectiveness depends largely upon the infecting organism. If the infection is produced by the pneumococcus, streptococcus, staphylococcus, or possibly the B. mucosus capsulatus, and the H. influenzae one should expect satisfactory results with these drugs. However, if the pneumonia is not caused by one or another of these micro-organisms, there is little reason to hope for success with this form of treatment. Hence, it is expedient that the causative agent of each case of pneumonia be determined, although this does not mean that chemotherapy should be withheld until a bacteriologic diagnosis has been made, as the clinical diagnosis of pneumonia constitutes ample indication for the prompt use of the drug. The information derived from bacteriologic studies is of particular importance in those patients failing to respond to the drug within 24 to 36 hours. In such cases, if the infection is due to a sulfonamide affected organism, the drug should be continued and, if necessary, additional therapy, such as specific serum, if available, may be administered. On the other hand, if the pneumonia is caused by an infectious agent not susceptible to the drug, then it is advisable to discontinue chemotherapy within 72 hours, as it will no doubt prove ineffective and may possibly give rise to serious toxic reactions, especially if the drug is continued beyond this time.

IMPROPER SELECTION OF DRUG

A number of sulfonamide compounds have been shown to possess a high degree of antibacterial action against many kinds of experimental infections, but, because of their behavior and toxicity in man, only a few have proved to be of clinical usefulness. It becomes apparent, therefore, that we should select the drug most likely to give the best therapeutic results in a given case of pneumonia. The relative effectiveness of these drugs in the treatment of pneumonia depends largely on three factors, namely: (1) the antibacterial activity of the drug; (2) the ability of the drug to enter into and remain in the circulating blood in effective concentration, and (3) the toxic reactions associated with the use of the drug. On the basis of these factors, it is now generally recognized that sulfadiazine is the drug of choice for the treatment of pneumonia produced by the pneumococcus, streptococcus, staphylococcus, B. mucosus capsulatus, H. influenzae, and those cases in which there is a mixed infection.

CHEMOTHERAPY STARTED TOO LATE

Clinically, it has been demonstrated that the sulfonamides exert their greatest effectiveness in pneumonia when they are administered early in the course of the disease. Although the precise mechanism through which these drugs exert their action is not completely defined, we do have, as a result of laboratory studies and clinical trial with the sulfonamides, some understanding as to the nature of the phenomena. Reduced to simple terms, the most plausible explanation of their action is as follows: Bacteria must have proper nutriment in order to multiply and, apparently at some stage of bacterial reproduction, a nutritive factor, similar in basic chemical structure to the sulfonamides, is required. This nutritive factor has been shown to be para-aminobenzoic acid, although other substances may well play similar roles. Therefore, should the bacteria be unable to distinguish between para-aminobenzoic acid, which is essential, and the sulfonamides, which have no nutritive value, the organisms cease to multiply and finally meet destruction. Thus, it appears

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that the sulfonamides possess a bacteriostatic effect which does not directly destroy the bacterial cells, but which leads indirectly to the destruction of the organism by virtue of their antagonistic action through interference with bacterial proliferation. Hence, the effectiveness of the sulfonamides against bacteria depends to a large extent on the ratio of the number of molecules of sulfonamide on the one hand and the bacterial supply of nutrient substance on the other. It is not surprising that the antibacterial effect of these drugs is less in lesions containing large amounts of food for bacteria, as is the case when necrotic tissue or pus formation is present. It appears, therefore, that their effectiveness is determined chiefly by the situation of the infecting organism and the pathologic character of the infected tissue. Hence, in the treatment of pneumonia the best results are obtained when sulfadiazine is given early in the infection, while the number of bacteria is still limited and the extent of tissue breakdown is at a minimum. In a recent paper by our group, dealing with the treatment of 1,635 cases of pneumococcic pneumonia with the sulfonamide drugs, it was shown that in those patients (451) in whom treatment was started within the first 48 hours of the disease, the mortality rate was 3.3 per cent, as compared to 17.9 per cent in patients (633) receiving treatment after the first 96 hours of their illness. Not only was there an increase in mortality rate, but also the incidence of complications was much greater in those patients treated late in the course of the disease. It follows, therefore, that the length of time that elapses between the onset of the infection and the beginning of sulfonamide therapy represents the most important controllable factor in the prognosis of pneumonia.

INADEQUATE CHEMOTHERAPY

To obtain maximum therapeutic results with sulfadiazine in the treatment of pneumonia, it is necessary to administer the drug in such a manner as to attain effective concentration of the drug in the circulating blood as soon as possible, and to maintain it until the patient has developed sufficient immunity against the infection to prevent a relapse. Failure to obtain an adequate concentration of the drug in the blood naturally leads to unsuccessful sulfonamide therapy. Since the drug concentration in the blood is dependent both on the rate of entry into and the rate of exit from the blood stream, the intelligent use of sulfadiazine demands an understanding of the factors concerned with its absorption by and excretion from the body.

Sulfadiazine, when administered by mouth, is nearly completely absorbed from the intestinal tract within 4 to 6 hours after the ingestion of a moderate (3 gm.) dose, although the amount of free drug in the circulating blood diminishes quite rapidly after the fourth to sixth hour. Since low or varying blood concentrations of the drug give rise to diminishing therapeutic effectiveness, it is necessary to administer a large initial dose, followed by additional drug at 4 to 6 hour intervals until the total dosage has been given. Obviously, when the drug is given by vein, higher blood levels of free sulfadiazine (12 to 18 mg. per 100 c. c.) are obtained more rapidly (within 15 minutes) than when equal amounts (3 gm.) are administered orally. Following the absorption of sulfadiazine into the blood stream, it is partially conjugated by the liver into the para-acetyl derivative, which is less soluble, less active, and tends to be more toxic than the parent compound. Approximately 15 per cent of sulfadiazine appears in the circulating blood as acetylated drug. Regardless of the route of administration, sulfadiazine is excreted mostly in the urine, both the free and acetylated forms, and the excretion of a single dose is almost complete within 36 hours. The excretion of sulfadiazine by the kidneys is reduced in the presence of renal damage and with a decrease in kidney function an increase in drug concentration in the blood occurs, especially of the acetyl fraction. However, the clearance of drug is definitely increased by an increased flow of urine, but should the volume of urine become low, the possibility of stone formation in the urinary tract by precipitation of crystals of the acetyl compound is greatly increased.

From the above discussion, it becomes apparent that adequate chemotherapy depends largely upon two factors, namely (1) the methods used in administering the drug, and (2) the scheme of dosage employed.

(1) *Methods of Administration.*—In general, the oral administration of sulfadiazine has proved the most satisfactory route in the treatment of pneumonia. However, in certain instances where a more rapid elevation of the blood level of the drug is desired, as in seriously ill patients, or when oral medication is impossible or impracticable, as in cases with severe vomiting or in certain types of postoperative conditions, it is often expedient to resort to intravenous therapy. In order to administer sul-

fadiazine parenterally, it is necessary to employ the sodium salt of the drug. The best results with sodium sulfadiazine are obtained with a 5.0 per cent solution of the drug in freshly distilled sterile water, given by vein. However, if necessary, the drug may be administered in an 0.5 per cent solution subcutaneously, although we do not advocate the latter route of administration, in view of the potential danger of severe local tissue reactions associated with its use.

(2) *Dosage.*—It is impossible to outline a course of sulfonamide therapy which will suit the needs of every pneumonia patient, as several factors tend to influence the amount of drug found in the blood as well as the amount of drug necessary to obtain the desired therapeutic results. The infecting organism, both as to its susceptibility to the drug and as to the severity and type of lesion which it produces, must be considered. Moreover, certain other factors, such as drug absorption, kidney function, and the state of dehydration, all affect the concentration of the drug in the circulating blood. Therefore, it seems reasonable for practical purposes to administer the approximate amount of drug which experience indicates will probably be therapeutically effective in most cases of the disease which are susceptible to this form of therapy. The following recommendations on dosage are for the treatment of pneumonias of adults requiring full amounts of the drug.

Theoretically, all patients treated with the sulfonamides should be followed by frequent estimation of the concentration of free drug in the blood. However, experience with sulfadiazine in the treatment of pneumonia has failed to show any consistent correlation between therapeutic effectiveness and the blood level of the drug, although it appears that if a blood level of 5 to 10 mg. per cent of free drug is maintained, satisfactory results may be expected in most cases of pneumonia. As a rule it is not necessary to check routinely the blood concentration of the drug unless the patient fails to respond to chemotherapy within 24 to 36 hours and if it is below 5 mg. per cent, dosage should be increased. Usually, this level can be realized by administering an initial 3 to 4 mg. dose of the drug by mouth, followed by 1 gram every 6 hours thereafter. It is possible, in most cases, to adhere to this 6-hour dose schedule, but occasionally, when a higher blood level of drug is desired, the 1 gram dose is given at 4-hour intervals. Frequently, in seriously ill patients, it is well to give the initial dose (3 to 4 grams of sodium sulfadiazine) by vein and at the same time start 1 gram doses of the drug every 4 hours by mouth. Patients in whom oral therapy is impracticable or impossible are given 2 grams (sodium sulfadiazine) intravenously every 10 to 12 hours until the total dosage has been administered. In general, the total dosage of drug, regardless of route of administration, is 20 to 30 grams, depending on such factors as the day of disease when treatment was started, presence of bacteremia, spread of the infection, and complicating disease. However, once drug treatment has been started, it is important to continue the drug until complete clinical cure is obtained. Not infrequently, a fall in temperature proves deceptive, and a spread or recurrence in the infection will occur if treatment is stopped too early. Chemotherapy should be continued until the patient has developed sufficient immunity against the infection to prevent a relapse, although the time required for the development of an immunity varies with individual patients and infections. In general, the drug should be administered in full amounts until the temperature has remained normal for 48 hours, along with evidence of clinical improvement. A safe procedure to follow when in doubt, is to reduce the dose gradually over a period of days and watch the patient carefully for any evidence of recurrent infection. Not infrequently, an infectious process will be masked by the action of these drugs, and after chemotherapy has been discontinued, the signs and symptoms of the infection will manifest themselves.

DRUG TOXICITY

As is the case with many other chemotherapeutic agents, sulfadiazine gives rise to a variety of toxic manifestations, and in order to employ this drug intelligently, one must be familiar with the potential dangers associated with its use. Fortunately, most of these toxic effects are not serious, and, if the patients are closely followed, the more severe reactions may be minimized. Furthermore, the incidence of severe toxicity is increased with its prolonged administration, but, since this compound exerts its maximum therapeutic effect within a comparatively short period of time, the necessity of continuing chemotherapy for longer than 6 days is most unusual in the treatment of pneumonia, except in cases with complications. In order to recognize and control these toxic reactions, the employment of certain clinical and laboratory procedures is essential, as, not in-

frequently, the untoward effects of the drug prove more harmful to the patient than the disease itself. Skin rashes may occur at any time after the beginning of treatment, especially after the fifth day. In such cases it is best to stop chemotherapy, particularly if exfoliative dermatitis is present, although the drug may be continued with caution, if necessary. Drug fever is most commonly seen 5 to 10 days after treatment has been started, but may occur at any time. Not infrequently it is difficult to determine whether the temperature rise represents a drug reaction or a recrudescence of the infection. Except in complicated cases, the fever of the original infection is usually normal by the third day of treatment and, if the patient is clinically improved, one should suspect a secondary rise in temperature as being due to the drug. Drug fever is often followed by dermatitis, hemolytic anemia, or neutropenia, and if it occurs, treatment should be stopped, unless the risk to the patient of continued infection seems greater than the risk of a severe drug reaction. As a rule, if the fever is due to the drug, it will drop within 24 to 48 hours, if the drug is discontinued and fluids are forced.

The toxic reactions involving the urinary tract constitute the most important problem in this type of chemotherapy. The renal complications are due in part, if not entirely, to the presence in the urinary tract of crystals composed of the drug, especially the acetyl portion. However, the presence of crystalluria alone does not indicate renal involvement, unless it is associated with progressive oliguria, hematuria, azotemia, or loin pain. Not infrequently, microscopic hematuria accompanies pneumonia and, unless a progressive number of red blood cells is detected, or other evidence of renal damage is apparent, cautious treatment may be continued, but it should be remembered that hematuria is often a precursor of severe renal insufficiency. Obviously, the appearance of gross hematuria, or any of the above kidney complications, are indications for stopping the drug and, at the same time, fluids should be forced, the urine alkalinized, and hypertonic glucose solution administered intravenously to promote diuresis. Occasionally, ureteral catheterization is indicated, but should be employed only after other measures have failed. Since crystalluria from the drug appears to be less frequent in an alkaline urine, it is advisable to administer alkalis in equal amounts to all patients receiving sulfadiazine. However, the maintenance of an urinary output of at least 1,200 c. c. daily constitutes the most important factor in preventing the occurrence of severe renal complications.

Acute hemolytic anemia usually occurs during the first 4 days of treatment and requires cessation of chemotherapy and transfusion of citrated blood. Mild anemia of the hemolytic type is frequently seen and the drug may be continued, but should the hemoglobin fall below 60 per cent, transfusions are indicated. Depression of the white blood cells may occur at any time, although there have been no cases of agranulocytosis which developed within the first 12 days of treatment. It is best, therefore, to check the blood constituents every two to three days, especially in cases requiring the drug for longer than 10 days. Nausea and vomiting occur in approximately 5 per cent of patients receiving the drug and should the vomiting become severe, it is advisable to check the serum chlorides.

Theoretically, the only possible contraindication to the use of sulfadiazine is a history of a previous sensitivity to sulfanilamide, or one of its derivatives. However, in our experience, there have been a number of instances in which patients have developed toxic reactions to one member of this group of drugs and not to another, although this would not necessarily indicate that the patient would not have experienced an untoward reaction to the original drug. In such cases, with histories of previous sulfonamide toxicity, it has been our practice to administer chemotherapy at once and follow the patient very closely, rather than withhold drug treatment. The presence of anemia, jaundice, acute nephritis, leukopenia, or neutropenia, per se does not contraindicate sulfadiazine therapy, as these conditions will usually disappear as the infection is brought under control by adequate chemotherapy. Obviously, if such conditions are present, necessary measures should be taken to detect their further development. We know of no medication or food which cannot be given to patients receiving the drug.

ANTI-SULFONAMIDE SUBSTANCES PRESENT

As mentioned above, the presence of necrotic tissue or pus in a lesion prevents the sulfonamides from acting upon bacteria with the same maximum effect which they exhibit in diffuse, non-suppurating infections. Hence, if a case of pneumonia be complicated by a pus-containing lesion, such as empyema, sulfadiazine is relatively ineffective. It follows, therefore, that the most important single factor in the successful management of such cases is the location and

removal or drainage of the confined pus by proper surgical procedures. This does not imply, however, that sulfadiazine is contraindicated, as it should be continued in the hope of preventing a spread in the infection. Failure to detect and adequately manage these complications often leads to the unsuccessful treatment of pneumonia.

FAILURE TO EMPLOY OTHER ESTABLISHED THERAPEUTIC MEASURES

Regardless of the proven value of sulfadiazine in the treatment of pneumonia, it is to be remembered that it is not to be employed to the exclusion or neglect of other established therapeutic measures.

(1) *General Supportive Treatment.*—All cases of pneumonia should receive competent nursing care, sufficient fresh air, adequate bowel elimination and prompt relief of abdominal distention. Such measures as enemata, rectal tubes, local heat to abdomen, and the use of pituitrin-like drugs are often necessary. The administration of oxygen in pneumonia is often helpful in the relief of cyanosis and dyspnea. Close attention to and the employment of appropriate measures for the correction of any disturbance in body fluids, electrolytes, or blood constituents are important factors in the treatment of this disease. If the infection is regarded as primarily atelectatic, dependent upon obstruction of the bronchus by secretion, as is the case in the majority of postoperative pneumonias, every effort should be devoted to removing the obstruction. Frequent changes in position and deep breathing are indicated. Collections of secretion in the trachea should be aspirated. The employment of 5 to 10 per cent carbon dioxide in oxygen and steam inhalations are at times effective. Postural drainage, with the patient on the unaffected side, if the operative wound permits, is occasionally helpful. If these simple measures prove ineffective in a case with signs of bronchial obstruction, the bronchoscopic removal of the bronchial plug often produces excellent results, but this procedure should not be deferred too long.

(2) *Specific Sera.*—Although the role of type specific serum in the treatment of pneumococcic pneumonia remains a controversial matter, it seems that certain cases should receive serum. Certainly, patients in whom severe drug reactions prevent the further use of the sulfonamides should be given serum, and those failing to respond satisfactorily to chemotherapy within 24 to 48 hours, should be given type specific serum in combination with the drug. Furthermore, when the pneumonia is due to a Staphylococcus aureus or B. mucosus capsulatus infection it seems advisable to employ appropriate serum in addition to sulfadiazine.

SUMMARY

Out of the basic considerations just presented we may derive several points which, if consistently recognized in the management of pneumonia, will, we believe, contribute to constantly improving results. If a case of pneumonia fails to respond satisfactorily to sulfonamide treatment it is important to search for an explanation. The following should be thought of as possible causes for the unsuccessful sulfonamide therapy of pneumonia.

(1) Pneumonia not due to sulfonamide affected organisms.

(2) Improper selection of drug.

(3) Chemotherapy too late.

(4) Chemotherapy too little.

(5) Drug toxicity.

(6) Anti-sulfonamide substances present.

(7) Failure to employ other established therapeutic measures.

DISCUSSION (*Abstract*)

Dr. William B. Porter, Richmond, Va.—I should like to ask Dr. Flippin two questions (1) what have been his results in patients with pneumococcic infections who have acute pneumococcic endocarditis as a complication? Our patients have shown consistent improvement, but all relapsed when the drug was withdrawn and all have eventually died. (2) It would seem that some physicians adjust their doses of the sulfonamides on the basis of the seriousness of the disease. If the disease appears mild, the dose is small, and if it appears severe, the dose is large. Our feeling is that the dose should always be adequate; the variation should be not in the size of the dose but in the rapidity of administration. In the very severe diseases such as pneumonia on the fourth day with pneumococcic bacteriemia we invariably begin therapy with the intravenous use of one of the sodium salts.

Dr. Worth B. Daniels, Fort Bragg, N. C.—I would like to ask Dr. Flippin if we are to take literally his statement that sulfadiazine should be given to every patient with pneumonia, regardless of etiology and clinical findings. We have seen several hundred soldiers ill with primary atypical pneumonia during the past year. The sulfonamides are quite without effect in this disease. We are of the opinion that their use is not only without value, but in many cases harmful. Minor toxic reactions seem more common in these patients treated with sulfonamides than in those who actually need them. With experience, it is possible to make the differentiation early between atypical and lobar

pneumonia. In the latter group there should, of course, be no delay in beginning sulfonamides; in the former they should be withheld. When there is doubt as to diagnosis, the drug should be given for from 48 to 72 hours and withdrawn if there is no response.

Dr. Flippin (closing).—In my experience the mortality from acute pneumococcic endocarditis has been 100 per cent, as in every instance the diagnosis was made at autopsy. I am unable to say whether some of those cases in which we suspected the condition and which later recovered actually had the disease or not. I am in perfect agreement with Dr. Porter regarding the dosage of drug employed. In seriously ill cases it is always best to give the initial dose intravenously and to start the drug by mouth at the same time. In this way one is able to obtain an effective concentration of the drug in the blood more rapidly.

The answer to Dr. Daniels' question is yes. I feel that every case of pneumonia should be started on sulfonamide therapy as soon as possible and, if the clinical course of the disease, laboratory, and x-ray studies suggest that you are dealing with a pneumonia which is not susceptible to the drug, then it is well to stop chemotherapy after 72 hours. It is true that in many instances the diagnosis of primary atypical pneumonia can be made immediately, but not infrequently it is very difficult, especially if you are treating a patient at home, to differentiate between a pneumonia which is susceptible to the drug and one which is not. Since the more serious toxic manifestations from the sulfonamides do not appear during the first 48 to 72 hours of therapy, the chances of getting a severe drug reaction during this time are not very great.

In closing, I wish to re-emphasize two points: First, that despite the proven therapeutic effectiveness of the sulfonamides in the treatment of pneumonia, they are not to be used to the exclusion or neglect of other established measures in the control of this disease. Second, if the sulfonamide drugs are used with regard for their toxic possibilities and if the patients to whom they are administered are thoroughly studied and carefully followed, it is a form of therapy with a satisfactory margin of safety.

PHYSICAL THERAPY MEASURES IN THE TREATMENT OF PERIPHERAL VASCULAR DISEASES*

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The value of the physical medium in the treatment of disease is the perennial question in the minds of physicians engaged in active practice, and no exception has been made in the case of treatment by this method in the peripheral vascular field. The data herewith presented in this paper will be utilized to dispel this question in the treatment of poor peripheral circulation.

It is common knowledge that the efforts of both physician and physicist are united against arteriosclerosis, the scourage of mankind. In their attack against this major disease sight has not been lost of its associate diseases, such as vasomotor disturbances, traumatic organic diseases, and the inflammatory organic diseases, which have likewise received a potential blow with the progress of physical medicine. That there is room enough in every office for a *materia medica* and an electric generator will not be denied by any physician.

This paper does not propose to give the impression that longevity is the outcome of resorting to physical measures. One cannot determine at this time whether the average life span is actually increased by these combined efforts. As an illustration, the arteriosclerotic with diabetic gangrene is usually a younger individual than the arteriosclerotic without diabetes, and here we see control of infection and healing of the limb in the first case, thereby prolonging life; while in the latter the patient becomes more active as result of improvement in his limbs, and overtaxes a damaged heart with resulting failure. Every physician, undoubtedly, has had examples of each of these groups and has observed the one great achievement in each group, not necessarily longevity but a more comfortable satisfactory life.

Any disturbance with the blood flow to or from an extremity constitutes peripheral vascular disease. Therefore, the physical therapy measures in the treatment of both the venous and arterial tree of the extremities are included in this paper. However, mention should be made of the possible benefit to other peripheral vessels such as those in the kidney, very satisfactorily treated for anuria by diathermy, and certain ocular conditions treated by artificial fever therapy. Such patients and many others are reaping the benefits of an ever broadening horizon in the practice of medicine as the trend in recent years has been toward conservative therapy as against radical surgery.

PHYSICAL MEASURES

(A) *Rest.*—Rest, under proper physiologic circumstances, must be considered a physical agent. Elevation of seriously affected limbs pro-

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duces blanching and pain and on dependency marked rubor or venous congestion, neither being conducive to proper circulation. Reid[1] in his studies found that every patient has an optimum elevation and this is usually below heart level. At this level the veins are filled but not distended.

(B) *Baths.*—The foremost physicians of antiquity, clinicians of the caliber of Galen and Aretaeus, devoted considerable attention to the use of water in therapeutics. Hippocrates wrote much about hydrotherapy. These factors play a large part in the treatment of peripheral vascular diseases.

Contrast Baths.—These are mentioned largely to be discarded. The technic requires two containers, one with water around 98° F. and the other ice water. Now the extremities are immersed into the warm water (from 3-10 minutes) and then into the cold water (from 1-3 minutes), alternating this procedure 2 or 3 times and three times a day. The idea of vascular exercise sounds reasonable by alternate vasodilatation and vasoconstriction but many severely involved limbs may be thrown into a disastrous vasoconstriction. Ulcerated extremities also are a contraindication because of possible maceration and wet gangrene.

Sitz Baths.—These seem less radical if the temperature of water is kept at a comfortable elevation 98-100° F. Here you get a reflex vasodilatation which is constant as the entire body is immersed. Ulcerations are contraindicated.

Whirlpool Baths.—These also are limited as are all baths which are in contact with the artery-affected extremity. However, in selected cases and particularly in old indolent varicose ulcers the whirlpool baths are very beneficial for cleansing reasons and there is also the massaging effect from the swirling water.

Soaks.—Mild solutions of boric acid, magnesium sulphate, and so on, used in the form of compresses to the ulcerated area are indicated. These should be used only 20-30 minutes 3 times a day to keep the wound soft and free from crusting (which holds in infection).

(C) *Local Heat.*—This is mentioned to be condemned. Starr[2] in his experiments has proven that increased local metabolism in the presence of an already impoverished blood supply hastens gangrene. Hot water bottles, electric pads and all the various bed warmers of this type should be only a memory.

(D) *Reflex Heat.*—This is produced by application to the trunk of various physical measures as infra red, short wave or diathermy, electric pad or hot water bottles. Landis and Gibbon[3] proved that by immersion of both hands and arms into water at 113° for 30 minutes a reflex dilatation was obtained in the legs and vice versa. These methods are our most useful, as they can be employed in all cases.

(E) *Cold.*—This is our newest weapon and has possibilities of being the greatest physical measure in treatment of the artery-deficient extremities. Allen[4] and associates show that cell metabolism is reduced to a minimum with no permanent structural change, the vessels are not damaged and the blood remains a circulating medium. Refrigeration, therefore, can be used to decrease the metabolism of the part sufficiently so that the inadequate blood supply is capable of maintaining the viability of the extremity. Previously, in the presence of interference with vascularity of the extremities it has been the popular practice to apply local heat; and yet according to investigations of Allen[4] and Starr,[2] the use of heat in this way is probably the worst thing that can be done. With the refrigeration we get the desired decreased metabolism of the cells so that vitality can be maintained with an impoverished blood supply, but we also get an undesirable vasoconstriction which further decreases the blood supply. However, our vasoconstriction can be controlled by paravertebral block.[5]

Refrigeration also prevents edema and inhibits bacterial growth. In the venous tree it has diminished in its usefulness, being only used for short periods to check periphlebitis in superficial phlebitis. It should not be considered in deep phlebitis or milk leg.

(F) *Active Vascular Exercises.*—Buerger's exercises constitute three positions of the extremities with fixed time: (a) elevation on 3 pillows 10 minutes; (b) hang over bed 10 minutes, and (c) put out straight on bed 10 minutes. This is repeated 3-5 times daily. The physiologic response expected by the alternating emptying and filling of vessels is partially satisfied.

Allen's[7] exercises are similar with additional foot movements, a definite added benefit.

Wright's[8] modification seems more physiologically correct. Make the test to determine necessary time to produce pallor of the affected foot by elevation and the time necessary to produce rubor on dependency. These times should be used in doing the exercise rather than the

fixed schedule: If pallor in 2 minutes, then elevate the leg only 2 minutes and if rubor in 1 minute, then lower the leg only 1 minute.

(G) *Pressure Suction Boot.*—This apparatus, devised by Herrmann,[9] is also a vascular exercise dealing with changes in atmospheric pressures. It consists of a pyrex boot which fits the thigh of the patient by a rubber cuff, and alternatingly in a regular length cycle, air is pumped from the boot and pumped into the boot. The other portion of the instrument contains motor and pumps. In pumping air from the boot a vacuum is created about the limb with the impoverished blood supply or, as another expression, the atmospheric pressure is much reduced. The physiologic reaction therefore expected is vasodilatation, other conditions being favorable. Now when air is pumped into the boot the extremity is again under the influence of atmospheric pressure and a vasoconstriction results. Therefore, with the alternating vasoconstricting and vasodilating influence on the artery, produced in a regular cycle simulating very closely the heart beat, we should expect good results. We do get good results in properly selected cases, but the results are less than the impressions obtained from early investigators. There are also contraindications to treatment of spreading infection and in thrombophlebitis producing emboli.

(H) *Reactive Hyperemia and Intermittent Venous Occlusion.*—This is based on experiments by Bier,[10] brought up to date mechanically. The apparatus has a motor and a pump which automatically pumps and releases pressure by means of a rubber tube into a cuff on the extremity. This cuff is similar to one on a blood pressure apparatus. The mechanical effect to the extremity is one of constriction of the venous tree, which in turn should produce the physiologic response of reactive hyperemia. The basis for beneficial response in this method is much debated. Its ardent advocates extol its merits because of its simplicity.

(I) *The Vas-oscillating Bed.*—This is a motor driven rocking bed brought to our attention by Sanders.[11] The mechanical effect produced in emptying and filling of vessels as the bed automatically and rhythmically goes through the motion of feet down head up and vice versa. The physiologic response is similar to Buerger's exercises except with this bed there is no effort on the part of the patient to complete the exercises. This is a hospital procedure and the patient should receive long and continuous treatment for best results. This is very useful in the patient who is unable to do his exercises.

(J) *Artificial Fever Therapy.* — A cabinet, large enough to accommodate a man lying, containing an electric heating unit and humidifier, constitutes the apparatus for this type of therapy. It has other useful accessories as rectal indicating thermometer and fans at the head. Only the head is outside of the cabinet when the treatment is in progress. However, other parts of the body are easily accessible by sliding doors.

Snow[12] indicates its use in certain diseases where the disease resisting mechanism is stimulated and so, indirectly, invading micro-organisms are adversely influenced. Also there are certain conditions in which fever therapy is utilized where increased blood flow, dilatation of vessels, increased capillary bed produce direct circulatory effects. The physiologic response is by reflex stimulation primarily, with regard to peripheral vascular diseases. The reaction gives similar results as intravenous therapy (typhoid) but on a better controlled basis.

(K) *Mecholyl Iontophoresis.*[13]—This is the introduction of mecholyl ions into the superficial tissues by common ion transfer. Usually a 0.2 to 0.5 per cent aqueous solution is used. Asbestos paper is soaked in this solution and wrapped about the extremity. An electrode of tin foil or Crook's metal is now placed over this paper and connected with the positive pole of a galvanic apparatus. The negative pole can be placed on any other portion of the body. The physiologic action with mecholyl is vasodilatation and it helps break up exudate. Other solutions may be used to good effect: salt solution 1 per cent in fibrotic areas and bichloride mercury 1/1000 in old thrombophlebitic areas. This treatment is also beneficial in the vasomotor disturbances, pernio (chilblain), scleroderma and arthritis.

TREATMENT OF ARTERIAL DISEASE OF EXTREMITIES AS USED IN OUR CLINIC

(A) *Treatment Used in Every Case.*—(1) All patients should be put at rest, bed rest depending on severity. Do not elevate on a pillow.

(2) Sitz baths and whirlpool baths are used if no ulcerations are present, at a temperature of 98 to 100° F. Compresses of boric acid solution or magnesium sulphate solution only are placed on infected ulcer areas for one-half hour three times a day.

(3) Local Heat. This is never used except the amount that may be generated in a regu-

lated heat cradle which extends up over the abdomen primarily for the purpose of reflex heat.

(4) Use hot water bottle or electric pad constantly to the trunk or infra red lamp or diathermy at regular intervals 3-4 times daily. Immerse hands and arms if the pathologic condition is in the feet into water 113° F. for 30 minutes 3 times a day. This group gives reflex heat.

(5) Wright's modification of the Buerger Allen exercises three times a day.

(B) *Treatments for Specific Cases.*—(1) Cold or refrigeration is still somewhat experimental as a treatment but proven as an anesthetic. The ground in this treatment has only been broken and it probably will be used soon in all but vasomotor cases routinely.

(2) Pressure suction in the arteriosclerotic group with or without diabetes and with or without ulcer, benefits patients who can walk 2-5 blocks without claudication. Cases with rest pain are always doubtful. Some benefit, others do not. Never use this in phlebitis or spreading infection.

(3) Intermittent venous occlusion is used only in the home because of simplicity. Its benefits are still in question. It is used in the same type of case as is suction pressure.

(4) Artificial fever therapy is used in Buerger's disease. To date we have 90 per cent cure over a 4-year period. The recurrence is in a patient who persistently smokes. Low fever is used 103 to 104° F. two to three hours, also allowing the foot to protrude from the cabinet if pain is experienced.

(5) Mecholyl iontophoresis is used in Raynaud's disease and scleroderma.

TREATMENT OF VENOUS DISEASE OF THE EXTREMITIES AS USED IN OUR CLINIC

(A) *Superficial Thrombophlebitis.*—(1) Elevate the extremity on one pillow. Do not massage but rest the extremity to prevent formation of emboli from dislodged clots.

(2) Ice cap to area 24-48 hours to limit area of periphlebitis, or x-ray therapy may be used for the same purpose.

(3) Heated cradle over extremity only; also local hot wet packs applied constantly to involved area to hasten absorption. The area is especially well treated if infra red or diathermy is given every hour for a period of 15-30 minutes.

(4) Elastic support is used as soon as pain is gone, and the patient may resume his usual duties in 4-6 days after onset.

(B) *Deep Thrombophlebitis.*—(1) Bed rest is ordered and the extremity is elevated on two or three pillows.

(2) A heated cradle, very large, covers the abdomen of the patient which will help produce a reflex vasodilatation.

(3) Restrict salt and fluids to 1,000 c. c. a day. This helps in combating edema.

Any One or Combination of the Following:

(1) Perform an immediate paravertebral block of sympathetics and repeat if signs and symptoms warrant.

(2) Diathermy is applied over the low back and hip of the affected extremity in conjunction with sympathetic block. Treatments are given every hour to help keep sympathetics relaxed.

(3) Artificial Fever Therapy.—The temperature is elevated to 103-104° for two hours. This may be done twice a day if so elected. The principle involved primarily is relaxing sympathetics and increasing metabolism.

(C) *Varicose Ulcer and Associated Dermatitis.*—(1) Bed rest and elevate extremity on two or three pillows.

(2) Mecholyl iontophoresis or bichloride of mercury iontophoresis daily as tolerated. This is the most satisfactory method to heal the ulcer that simpler measures, such as Unna paste boots, are unable to relieve.

(3) After the dermatitis and ulcer are healed naturally, for permanent cure the veins must be properly treated, by ligation and injection.

Physical therapy has added a new impetus to the somewhat discouraged practice of treating peripheral vascular disease. It has placed in the hands of the physician undreamed of weapons for the conquest of disease, but many methods are new and require diligent application in their use.

It is very important that discretion be used in the selection of apparatus. This matter could not be overemphasized. Dexterity in their manipulation, it will be realized, can be acquired only by diligent practice.

Cognizance must be given to the factor of time in the treatment of peripheral vascular disease. The procedure at best must be a slow if not tedious one. Damage done in the course of years cannot be remedied by a few hurried treatments. Rapport with the patient should be effected to this end, thus eliminating any psychologic negativism that would precipitate an in-

hibitory influence and generate resistance. Attention must also be called to the importance of following up cases after recovery and giving additional treatment as individually warranted.

The different methods of treatment and the evaluation of these treatments presented in this paper readily show a constructive step in combating peripheral vascular disease, and, in conclusion, it may be suggested that careful perusal of the data presented and their application in practice will benefit not only the individual under treatment, but will go far in opening up new avenues of approach in the ever-widening field of physical therapy.

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DISCUSSION (*Abstract*)

Dr. G. J. P. Barger, Washington, D. C.—In addition to the methods Dr. Hildenbrand has given for the care of peripheral vascular diseases, there is another method which I feel should be more generally tried, because it has given good results in the few cases I have had. I heard it first recommended in two clinics in New York City, at Polyclinic and Cornell Medical Center, as I recall. It is practically a combination of some form of heat and the contractile or sinusoidal current. The treatment is given with the patient reclining, the legs elevated or not, depending upon the condition. The source of heat may be a large infra red lamp, not too intense, to the legs themselves. Preferably I use short wave diathermy, not to the legs, but best, to the full length of the spinal cord, or alternately over the large blood reservoirs of the lungs, heart, liver or intestinal tract. The contractile current electrodes may be fastened to the soles of the feet, or large electrodes laid across the legs midway below the knee, or over the quadriceps, to obtain rhythmic contraction of large muscle masses, favoring active circulation through the lymphatics and blood vessels as well. The contractile current and short wave diathermy may be used at the same time if used this distance apart. The contractile current can be regulated to such a comfortable strength and rate that the patient will actually go to sleep under it, and will easily take it for a half hour at a time. The short wave to the spine favors relaxation of nervous tension and improved functioning in the peripheral parts.

OCULAR MOTILITY THEN AND NOW*

By Wm. Thornwall Davis, M.D.
Washington, D. C.

It was with humility that I accepted the honor of being asked to give the Savage Lecture before my beloved Southern Medical Association. The honor is a great one, since our late colleague was an original thinker and a deep student as evinced by his writings and in particular by his book, "Ophthalmic Myology," written and published in 1902.

There is evidence in this work of deep thought and meticulous observation and study. To those who are interested in the very complicated study of this subject, I would recommend a careful perusal of this work. In it will be found, in somewhat different language and nomenclature from today, many of the basic facts further elaborated by Duane, Bielschowsky and others.

Professor Savage made a number of original contributions to the very difficult subject of ocular motility.

Dr. G. C. Savage was Professor of Ophthalmology at Vanderbilt University School of Medicine; author of "New Truths in Ophthalmology"; President of the Tennessee State Medical Association, and President of the Nashville Academy of Medicine. He was the convener of the group that organized the Southern Medical Association and was its President in 1908-1909.

Among many of the things which Dr. Savage stressed were the following:

Corresponding Retinal Points.—He made it obvious that this must be taken into consideration in all motor anomalies. He says that there are but two means by which the eyes may avoid diplopia if the image of the object looked upon

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falls upon parts of the two retinae that do not correspond. One is by suppression, and the other by forced fusion. The latter obviously will induce severe eye strain sooner or later. In the phorias, more particularly esophoria, because suppression is less likely to occur than in exophoria, Dr. Savage remarks that diplopia is more likely to occur when the motor disturbance places the image on the temporal side of the macula than on the nasal side.

We are more alive to the importance of normal retinal correspondence since there has been more careful study of squint. This habit, once engendered, is most difficult to overcome, and in some cases impossible. Hence, the necessity of preventing this unfortunate condition by early treatment of the squint. It is relatively easily prevented, but difficult to cure.

Dr. Savage dwells upon the presence of centers in the brain, remarking that their locations were not then known.

We know scarcely more than that now. We assume there are association centers, but we are not aware of their location. It is difficult to understand how such minutely perfect coordination can be had in the absence of such association centers.

As an example, one may mention a recent case seen in our clinic of divergence paralysis, quite classical in its symptomatology. Diplopia began at about 75 cm. with no variation of the diplopia in any direction of the gaze; reading was quite comfortable. This attack followed others of the same nature in a bad case of thyroid dysfunction following subtotal thyroidectomy. In this case such attacks appeared to be due to over-indulgence in alcohol and cleared up in about a fortnight with proper care and rest.

It is difficult to conceive of an explanation of these attacks other than an association cerebral area.

One of the very attractive aspects of Dr. Savage's book is its simple but elegant English, which makes the reading of it a pleasure. He avoids complicated formulae and tables, which is refreshing. He gives one table which is of great value upon the action of the extra-ocular muscles, both primary and secondary, together with their synergists and antagonists. This is not more clearly outlined anywhere. His sage remarks anent the table are most illuminating. Among them may be quoted the following:

"It will be noticed that every ocular muscle has one more antagonistic muscle than synergistic."

One may be cognizant of such things, but not thoroughly aware of them until one reads such a statement. Another very good statement will bear repetition:

"* * * Our judgment of verticality depends on the fact that the vertical axes of the eyes are parallel with the vertical plane of the head."

If we keep this in mind it will save us much grief when we study vertical motor disturbances, particularly when the obliques are involved.

Dr. Savage emphasizes the necessity of knowing both (1) the fields of rotation, and (2) the field of fusion, before deciding upon what muscle or muscles to operate. He insists upon a clear-cut diagnosis before one attempts surgery. This seems so obvious that it scarcely requires mention, but a perusal of much that has been written in the last two decades, anent operations upon the extra-ocular muscles, will clearly show that the operator was not conversant with methods of diagnosis. One cannot but assume this when the author of such a paper insists that a certain operation is the *sine qua non* for the cure of a squint or phoria.

Dr. Savage emphasizes the necessity of diagnosis before operating, even as Duane, Jameson, Bielschowsky and others have done.

In convergent squint or esophoria the diagnostic points are the same and surgery or orthoptic training, or both, is in order.

ESOPHORIA AND CONVERGENT SQUINT

This anomaly may be classified according to our present knowledge as follows:

(1) Mechanical (organic, non-functional)
  (a) due to convergence excess
  (b) due to divergence insufficiency
(2) Accommodative (functional, non-mechanical)
  (1) Mechanical esophoria or convergent squint due to
  (a) Convergence excess.

The esophoria or convergent squint is greater for near than it is for distance. The convergence near point is normal, 4-5 cm., or nearer than normal.

The prism convergence is increased; prism divergence normal or less than normal. It may be absent.

Rotations are usually normal in esophoria. Adduction (inward rotation) may be increased in esotropia. Abduction (outward rotation) may be decreased.

At times these findings are confused and the diagnosis of convergence excess cannot be as-

sured. Under these conditions where the diagnosis is in doubt, we always shorten the lateral rectus. Dr. Savage gave this advice long ago.

The treatment of esophoria or esotropia due to convergence excess is as follows: It does no good to put glasses on these purely mechanical convergent excess cases. Only an additional handicap is being added to the patient already greatly troubled. Orthoptic training can in itself offer no hope of cure. The only cure of a mechanical esophoria or esotropia due to convergence is surgery. Orthoptic training in conjunction with properly selected surgery offers every hope of cure, provided the phoria or squint has not lasted too long. If the treatment has been too long deferred we may accomplish a cosmetic correction, but not a cure. In our opinion, this is begging the question. A cure should be sought in every case. The patient has a right to expect that the ophthalmic surgeon be prepared to make such attempt. Since we are becoming a military nation, probably for all time if we are to survive, it is the bounden duty of the eye surgeon to seek two-eyed stereoscopic vision in every case of phoria or squint. If this is not secured, the boy may be barred from a commission in the armed forces. If he comes from the educated and intelligent class, our country needs him as a commissioned officer. We have not too many of this class. If he has not stereoscopic vision, he cannot make an efficient commissioned officer. There is not time to go into the details of this fact. 'Tis a pity 'tis true, but true it is, the main and principal business of our beloved country will be to make war for some time to come. It is assuredly true, particularly of the medical profession, that we must assist in this in every way possible. Granted that we are heart and soul in doing this, it is our duty to do it as efficiently as our level of intelligence permits in whatever walk of life we are. We, as doctors of medicine, are looked up to and are leaders, since we are intelligent and educated above the common people. It is our duty to our country in this time of stress and danger in particular to so conduct ourselves by precept and example that we meet the high position in our communities to which our countrymen have elevated us.

To do this, efficiency is not the least of our duties.

In order to do ocular surgery, particularly upon the extra-ocular muscles, deep study and much reading are necessary. We should see that we do it.

(b) *Esophoria or Esotropia. Due to Divergence Insufficiency.*—The esophoria or esotropia is greater for distance that it is for near. The convergent near point is normal or may be nearer than normal.

The prism convergence is normal or less than normal.

The prism divergence is decreased or absent. The lower it is, the more specific the surgical indications for shortening or advancement of the lateral rectus or recti. Under no circumstances should the median rectus be operated upon in a pure case of divergence insufficiency. It may be necessary both to shorten and to advance each lateral rectus. In all operations upon the lateral recti the convergence, that is the median recti, should be zealously protected.

It is unintelligent and reprehensible to weaken a median rectus in an attempt to correct an esophoria or esotropia due to a divergence insufficiency. Both Dr. Savage and later Dr. Jameson emphatically emphasized this. Yet in the writings of some ophthalmic surgeons who should know better, it is obvious that they have not informed themselves of these facts.

We should remember that ophthalmic surgery depends upon correct surgical diagnosis. This is difficult and requires study, thoughtful contemplation and mature experience.

Obtaining the necessary surgical technic is relatively simple. Good surgical judgment is not common. It is what tells in the long run. I recall an outstanding ophthalmologist who had the respect and esteem of the civilized world. His surgical judgment was superb, his operative technic acceptable, his results were most excellent.

The treatment of this form of esophoria or esotropia is surgical if a cure is sought. Glasses are of no value in so far as causing the squint is concerned, nor can they alter the angle. Considering glasses purely in the light of curative measures for this form of squint, they are valueless. They may be detrimental and a handicap.

Orthoptic training in conjunction with the surgery may be necessary for the functional cure. Without it, the result of the surgery may be cosmetic only.

(2) *Accommodative or Functional Esophoria or Esotropia.*—This form of convergent squint or phoria is of abnormal nervous origin and most frequently due to a hypermetropia which impairs the usual accommodation-convergence relations. Dr. Savage very meticulously describes this anomaly and emphatically says it

should not be operated upon. This has been further emphasized by us in a number of papers. To operate in such a case results in a divergent squint or an exophoria for distance and a convergent squint for near, and this condition is irremediable so far as our experience goes.

Dr. Savage advised full correction of the hypermetropia, with glasses to be worn all the time. Orthoptic training has taught us since then that the treatment is correct, but that orthoptic training instituted at the proper time and carried out in the proper way will cure many of these cases and enable them to have straight eyes without glasses before they go to school. Those who understand child psychology will appreciate what this means to the child throughout his whole life. We know of no greater handicap at the beginning of life than a crossed eye together with the necessity of wearing strong corrective lenses continuously throughout life.

Orthoptic training as mentioned obviates all of these disadvantages and in a majority of the cases will give the patient stereoscopic vision, which is a consummation devoutly to be wished.

We have treated 51 cases of purely accommodative squint.

Total number of cases seen	51
Number on active treatment at this date	6 or 11.7 per cent
Number incomplete because of lack of cooperation, moved to another city, and so on	20 or 39.2 per cent
Number of cases cured, minus those who did not complete treatment	21 or 70 per cent

Since we have been doing this work we look upon the cure of accommodative squint with the establishment of stereoscopic vision without glasses as one of the great advancements of this era.

EXOPHORIA AND DIVERGENT SQUINT

(1) Mechanical, organic, non-functional
  (a) due to divergence excess
  (b) due to convergence insufficiency
(2) Accommodative, functional, non-mechanical

Mechanical Divergent Squint.—It is unusual to find a case of divergent squint without an accommodative factor, the majority of patients having myopia.

Mechanical divergent squint is due either to convergence insufficiency or to divergence excess, and only surgery can effect a cure. When combined with orthoptic training to overcome suppression which is almost always present, the results are good. In our experience mechanical divergent squint is more difficult to correct than mechanical convergent squint. Suppression, which is likely to be intermittent, is difficult to overcome and consequently extended orthoptic training may be required and the case kept under observation over a long period of time.

Divergent squint due entirely to divergence excess is rarely found. Often exophoria is due purely to divergence excess, but by the time it has become an exotropia there is usually an added convergence insufficiency. In a case with pure divergence excess recession of one or both recti results in a most satisfactory cure that is often permanent, provided there is no convergence insufficiency or the anatomic anomaly is not so great that recurrence is likely. Obviously, orthoptic training and correction of the refractive error are concomitant necessities in obtaining a cure. May I emphasize the word cure, which means binocular vision with stereopsis. Without this the condition is only cosmetically corrected, not cured.

Accommodative Divergent Squint.—This form of squint differs in many respects from accommodative convergent squint. The child is myopic and uses little or no accommodation for near vision; consequently no convergence. He fixates with one eye; the other is relatively divergent. Hence, suppression occurs for near vision, which is therefore intermittent suppression. Slight amblyopia may occur, which later becomes more marked as the squint progresses from an intermittent to a continuous one.

The child has a divergent squint only for near at the beginning; hence, it is functional, that is, accommodative. The child, however, squints only when he is looking down; that is, for near work. Consequently it is not observed by the parents. Very probably his myopia will not be discovered until he goes to school. By this time the squint will probably have a mechanical factor in addition to the accommodative factor. It is obvious that we rarely see a purely accommodative divergent squint. It is equally obvious that surgery is not indicated if the case be entirely accommodative. Correction of the refractive error and orthoptic training will establish a cure. Full correction of the myopia is the first requisite in order that the accommodative-convergence relation may be restored. If this is not done the lack of stimulus of the convergence militates against the development of this function. Also the patient does not see clearly, and hence fusion is not properly developed.

Mechanical Divergent Squint Combined with Accommodative Squint.—Surgical correction and in addition correction of the refraction and orthoptic training are required. Surgery properly adapted to the particular case is usually satisfactory and accomplishes a cure in conjunction with the other treatment mentioned. The degree of the squint is usually not great, and there should be no failures in such cases. Failure could only come from improper diagnosis and illy conceived or improperly performed surgery.

Bielschowsky advised that no operation be done to correct divergent squint before adolescence because of the possibility of recurrence. This judgment was no doubt formed in Germany. In our country conditions are so different that it would not seem proper judgment here. Due to the adverse effect on the mental development of the child, any squint should be corrected and cured at the earliest possible moment.

THE HYPERPHORIAS

Dr. Savage wrote much to clarify this complicated subject, as did Duane and others. Bielschowsky gave a clearer depiction of the matter than anyone.

So far as our present knowledge goes, and according to Bielschowsky, the hyperphorias may be classified as follows:

(1) Paretic
(2) Pseudoparetic
(3) Concomitant
(4) Dissociated

(1) *Paretic Hyperphoria.*—This form is probably better known than any other since it has been the best understood. Many, many papers have been written on the subject. It is not too difficult if one conscientiously studies the anatomy and physiologic action of the eye muscles singly and as a whole. Such knowledge is essential to the understanding and diagnosis of paretic hyperphoria. When one has mastered these subjects one may at once proceed to the diagnostic studies of the ocular muscles in the various positions of the gaze, and after some practice be able to make diagnoses in a large majority of the cases.

The differential diagnosis of paresis of the superior (or inferior) rectus and the superior (or inferior) obliques had perhaps been the most confusing until Bielschowsky made the matter clear.

If one will get from the Eye Institute at Dartmouth College for one dollar the lectures of Bielschowsky and study them with extreme care, what once seemed insurmountably difficult will appear so no longer.

(2) *Pseudoparetic Hyperphoria.*—This name I gave to that form of hyperphoria aptly described by Bielschowsky as abnormal or anomalous check ligaments of the inferior oblique which permit it to have unrestricted action; that is to say, overaction of these muscles occurs. It may be confined to one inferior oblique or both may be involved.

When the involved eye is turned in, that is, adducted, in which position the inferior oblique has its maximum power of upward rotation of the globe, the upshoot of this eye is very marked. Should both inferior obliques be involved, we have a marked and high degree of hyperphoria of each eye; double hyperphoria.

The diagnosis may be confusing since it resembles superficially the overaction of the inferior oblique due to paresis of the superior oblique or the superior rectus. Bielschowsky states, and our experience teaches us his statement is correct, that the diagnostic difference lies in this fact: there is no hyperphoria in the primary position of the eyes.

The treatment is surgical only; myectomy of the inferior oblique is involved. In order for the effect of the operation to be permanent the fascia covering the inferior oblique must be stripped from 5 mm. or better, 10 mm. of the muscle and this portion excised. There will then be no return of the hyperphoria. In our experience, properly performed myectomy of the muscle gives excellent and permanent results.

(3) *Concomitant Hyperphoria.*—Let us think of this in terms of a concomitant convergent squint to prevent confusion in our minds. Like a concomitant convergent squint, concomitant hyperphoria may be monocular or alternating. Like concomitant convergent squint, it is the same in all directions of the gaze; it is approximately always the same in degree. These are the diagnostic symptoms. It may be present and complicating other forms of hyperphoria in which case the diagnosis becomes quite difficult. Its treatment is relatively simple. It is usually of low degree, 1 to 4 or 5 D. In women and in men beyond the military age, if symptomatic the symptoms may be relieved by incorporation of prisms in the glasses. It must be borne in mind that this is symptomatic and not curative treatment. In boys and men within the military age, only a cure is of value to the individual. There is no place for a commissioned

officer who has to wear glasses to prevent severe eye strain or diplopia. Those having 1 D. or more of hyperphoria are barred from the Air Service.

(4) *Dissociated Hyperphoria.*—Much confusion results from inability to diagnose this form of vertical deviation. In our experience, it is most frequently observed as a complication of high degree of deviation due to paresis, pseudoparesis, and concomitant deviation. We wish to emphasize this. Unless one realizes the frequency of dissociated hyperphoria as a complication of the higher degrees of both lateral and vertical deviations, one will be likely to miss the diagnosis. In such a case the treatment may be catastrophic. To operate upon a dissociated hyperphoria is fatal to the motor apparatus of the eye, probably for all time. It can never again function with binocular vision. The characteristic signs and symptoms of dissociated hyperphoria are as above described, that is: (1) its likelihood of complicating other forms of deviations, (2) it is never the same at any two measurements. This we look upon as its most characteristic symptom. With a dark red glass before each eye the red image will be below in each instance; that is to say, each eye will turn up when covered by a red glass dark enough to prevent fusion. We look upon the variability of dissociated hyperphoria as being the most characteristic sign.

It is to be treated by curing the mechanical, lateral or vertical deviation first. After this, the dissociated hyperphoria can be largely cured by orthoptic training in order to give the patient a wide amplitude of fusion. The dissociated hyperphoria being of purely neurogenic origin and very probably due to the patient's having poor or no fusion, it is obviously necessary to remove the cause of its presence in order to obtain a cure.

We must again here emphasize that the lateral deviation must be relieved. Should there be an organic vertical, this, too, must be relieved by proper measures before the treatment of the dissociated hyperphoria is begun.

We will now consider the relation of hyperphoria in general to the lateral imbalances.

In many instances, the hyperphoria usually of paretic origin, though concomitant hyperphoria may so act, is the cause of the lateral imbalance by making fusion impossible. When this situation obtains, if the "position of rest" is esophoric, there will probably develop a convergent squint. If the position of rest be exophoric probably an exophoria will result.

How may we distinguish between a lateral deviation which causes a hyperphoria and a lateral deviation which is the result of a hyperphoria?

Hyperphoria Causing a Lateral Imbalance.—Such a hyperphoria is of organic origin and is not neurogenic. Thus paretic hyperphoria is the usual form that causes a lateral imbalance, though it may be brought about by concomitant and less probably by pseudoparetic hyperphoria.

Hyperphoria the Result of a (Usually) High Degree of Lateral Imbalance.—This is always a dissociated hyperphoria and is to be distinguished by its variability, now present, now absent; the red glass test as described; the cover and prism test will show one day a right hyperphoria and another day a left hyperphoria and at another test a double hyperphoria. Obviously, such results cannot possibly be a paretic, concomitant or pseudoparetic hyperphoria, all of which give constant findings. In our experience, the diagnosis of dissociated hyperphoria is arrived at after several examinations have been made with the cover test and prism and synoptophore and finding on these examinations the variability as above described. The double hyperphoria with the dark red glass is considered diagnostic by Bielschowsky. So it is, but must be relied upon only after one has eliminated the possibility of a double hyperphoria due to the other forms of hyperphoria.

This sounds complicated, and it is. However, it is very necessary to a diagnosis, and without such a diagnosis one simply cannot treat successfully this form of motor disability.

In the one case, hyperphoria causing the lateral imbalance requires the surgical correction of the hyperphoria first. The establishment of fusion with a good amplitude may then be all that is required for the cure of the lateral imbalance.

In the other case, the hyperphoria which is the result of a high degree of lateral imbalance requires correction of the lateral imbalance first.

The dissociated hyperphoria, which is of purely neurogenic origin, will disappear upon the establishment of fusion with good amplitude by orthoptic training.

It will be observed from a careful study of

Dr. Savage's book that all these most complicated motor imbalances of the eyes are described. The terms are different, and the way of description, but it is all there, and in a simpler form than is usually followed. The most constant attribute of the true scientist, of the really great man, is simplicity. This our distinguished colleague, Dr. Savage, had in a marked degree, both in his writings and in his personal contacts. To know him was to admire, esteem and love him for these qualities.

THE CLINICAL SIGNIFICANCE OF THE SERUM PROTEINS*

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In this paper will be summarized the results of approximately seven years of effort to analyze clinical data in relation to blood serum protein concentration. Emphasis has been placed upon an interpretation of the changes in accordance with our most recent knowledge of protein physiology.

The reasons why it is important to recognize the existence of hypoproteinemia (hypoalbuminemia) are manifold. Shuman and Jeghers found that 25 per cent of the patients admitted to a medical service in Boston had hypoproteinemia. In the presence of hypoproteinemia, the healing of surgical wounds and burns is impaired; intestinal obstruction may be aggrevated; or symptoms may persist following surgical relief because of edema at the site of operation; shock may occur more readily or be aggravated unless blood protein is restored by transfusion of plasma or whole blood. The importance of these considerations in our war effort cannot be overestimated, and they are being given the attention they deserve by the medical services of the Army and Navy. When hypoproteinemia exists and it is desired to increase the interstitial fluid or plasma volume, intravenous administration of saline or other fluid which does not supply protein may lead only to accumulation of undesirable subcutaneous fluid. If the low protein is due to dietary insufficiency, it may indicate insufficiency of other essentials such as vitamins. Since edema is the only clinical sign of value and is present in only 3 per cent of the cases of hypoproteinemia (Shuman and Jeghers), it is necessary to use laboratory procedures to detect most of the cases.

Many procedures are available for the determination of serum protein concentration. The author's falling drop method for the determination of total serum protein is as simple and rapid to perform as a hemoglobin determination and may be done with as little as 0.1 c. c. of blood obtained from fingertip or vein. It is accurate to ± 0.2 grams per 100 c. c. and has a maximum error of approximately 0.5 grams. The total protein concentration determined in this way suffices for most clinical purposes. A high total protein almost always indicates high globulin concentration and a low total protein almost always indicates a low albumin concentration. Low globulin or high albumin concentration almost never occurs. When the total protein concentration is normal or low and it is desirable to know if the globulin concentration is above normal, the simple formol gel or globulin precipitation test may be done. Determination of albumin and globulin by the Kjeldahl method is the most accurate but unfortunately is relatively complicated and time-consuming. The colorimetric methods generally available are subject to errors up to 10 per cent.

No matter what method is used, it is important that certain conditions be maintained in the collection and handling of the specimen of blood (*Table 1*).

Temporary misleading increase in the serum protein concentration may result from certain physiological factors, such as hyperventilation, vigorous muscular exercise, stasis of blood due to chilling, marked sweating or small fluid intake. Similar lowering may result from a rise in the body temperature above normal or a fluid intake of over 600 c. c. in the absence of food.

DETAILS REGARDING SPECIMEN OF BLOOD

(1) Collect blood within 1 minute of application of tourniquet.
(2) Capillary blood gives essentially same values as venous blood.
(3) Use serum in preference to plasma.
(4) Avoid evaporation of specimen.
(5) Avoid hemolysis.
(6) Keep specimen in well-stoppered tube in ice box.
(7) Do determination within 24 hours of collection.

Table 1

*Read in General Clinical Session, Southern Medical Association, Thirty-Sixth Annual Meeting, Richmond, Virginia, November 10-12, 1942.

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The normal concentration of total serum protein is generally accepted to be 6.0 to 8.0 grams per 100 c. c.; of albumin 4.0 to 5.5 grams; and of globulin 1.5 to 3.0 grams. However, the total protein concentration is rarely normally over 7.5 grams or the albumin above 5.0 grams.

Since serum globulin and serum albumin are distinct from a chemical, physical, physiological, immunological, and clinical standpoint, their significance will be more apparent if they are considered individually. As regards the origin of albumin and globulin, the bulk of evidence to date favors the liver as the primary site of formations of serum albumin. Less is known of the origin of globulin; recent evidence indicates that the plasma cell and the reticulo-endothelial system everywhere may be the sites of origin of globulin. Physically the globulin molecule is about 2½ times as large as that of albumin. The osmotic influence of the albumin fraction is about four times that of the globulin fraction. Physiologically albumin is of much greater importance than globulin in the maintenance of blood volume and fluid balance in the body. The concentration of albumin in the blood fluctuates more than does that of globulin. In contrast to globulin, albumin is much more easily affected by the dietary intake of protein. Globulin is much more quickly regenerated following hemorrhage than is albumin. The immunity of the body to infections is dependent in large part upon the antibodies in the globulin fraction. Clinically, just as a patient usually has only one disease at a time, only one fraction or the other is principally involved. More than this, as stated above, the globulin fraction is almost never decreased below normal and the albumin fraction is almost never increased above normal.

The term "A/G ratio" has held a place in the vernacular of medicine by a precedent which began when Epstein first called attention to the clinical significance of blood proteins in 1912. The use of the A/G ratio, however, is misleading and probably accounts, at least in part, for the fact that the serum proteins have not received the clinical attention given to other chemical entities in the blood. The ratio gives us no conception of the actual change in either the albumin or the globulin concentration. For example, the A/G ratio is often reversed in lymphopathia venereum; it is likewise often reversed in nephritis. Note, however, that in lymphopathia venereum this is due to an increase in globulin, in nephritis it is due to a decrease in albumin. What we need to know, therefore, is the absolute concentration of albumin and globulin, not the A/G ratio. In the absence of these values the total protein concentration generally indicates a rise in globulin or a decrease in albumin concentration as discussed above.

One of the commonest causes of hypoproteinemia is malnutrition, which may be due to a diet poor in protein or to improper absorption or utilization of a diet adequate in protein content. Improper absorption may occur in diarrhea, cancer of the stomach or pancreas, intestinal fistulae, and so on. In diarrhea, in addition, serum protein may be lost to the body as whole blood or plasma in the stools. Even if properly absorbed, the proteins may not be synthesized if the patient has any form of liver disease.

Abnormal metabolism of the serum proteins may be found in cases of uncontrolled diabetes mellitus, pernicious anemia, or hyperthyroidism. When diabetes is uncontrolled, the serum protein concentration is low; and when controlled, it returns to normal. A diabetic whose blood proteins are low without other cause is probably not completely regulated. Likewise the low serum protein concentration which frequently accompanies pernicious anemia rises as the patient responds to treatment with liver extract. In hyperthyroidism also the serum protein concentration may be low and generally returns to normal after adequate surgery. In the latter disease increased blood volume as well as increased catabolism may be responsible.

Cancer, whether primary or metastatic, when it affects the stomach, pancreas, or liver, is accompanied by a lowered serum albumin concentration. However, when it does not affect these sites, the serum albumin concentration is normal even in the face of marked tissue emaciation. Cancer of the stomach and pancreas probably interferes with the enzymatic digestion of protein within the bowel. Cancer of the liver perhaps interferes with the anabolism of serum protein from the absorbed amino acids.

The lowest protein concentrations are seen in nephrosis or the nephrotic stage of nephritis. Contrary to the impression given by the frequent reference to the reversed A/G ratio the globulin is not usually increased above normal in these conditions.

In uncomplicated cardiac decompensation there is usually some lowering of the protein concentration, but it is rarely below 5.5 grams. This slight lowering is probably due to the increased blood volume which accompanies de-

compensation, and in these cases the protein concentration usually returns to normal with the return to compensation. Changes in protein concentration thus offer us some guide as to progress of the patient in heart failure.

Not infrequently when a patient has peripheral edema, the question arises as to whether this is due to uncomplicated heart failure or to chronic glomerular nephritis. If the total protein is above 5.5 grams or the albumin above 3.0 grams, the probability is that the edema is due to heart failure. When it is below this level, the edema is probably due, at least in part, to the lowered osmotic pressure or to low serum protein concentration such as is found in chronic glomerular nephritis. This point may be helpful in differential diagnosis.

Hypoproteinemia is of great importance during pregnancy. In certain cases of edema occurring during pregnancy the hypoproteinemia is due to improper dietary habits of the mother in addition to the protein drain caused by the fetus. When these patients are given adequate diets or plasma transfusion, the edema may disappear. Furthermore, the slight fall in serum protein concentration which frequently accompanies normal pregnancies, especially after the fifth month of gestation, becomes very marked in some of the toxemias.

Serum protein may be lost to the body by hemorrhage, either acutely as occasionally occurs in patients with peptic ulcer or chronically as may occur from hemorrhoids. There may be loss of plasma alone as in weeping forms of eczema or burns. Recently the importance of the correction of hypoproteinemia in these conditions and particularly in burns has been much stressed.

Certain causes of chronic poisoning such as benzene, carbon tetrachloride, phosgene and phosphorus produce hypoproteinemia, probably through their effect upon the liver.

Liver disease (cirrhosis particularly, also cancer, hemochromatosis and other conditions) is the commonest cause of simultaneous reduction in the albumin and increase in the globulin concentration. In the absence of the other two conditions noted below, such a change in blood protein may be considered strong evidence of liver disease. The increased globulin concentration which occurs when the liver is involved suggests that the liver cell or the Kupfer cell in the liver, a part of the reticulo-endothelial system, may be important in globulin formation. Next to cirrhosis, acute glomerular nephritis is the commonest cause of such a change in both albumin and globulin. The increase in globulin concentration in this disease is probably secondary to the associated infection. The only other circumstance in which we have found a change in both albumin and globulin is that in which two conditions are present, the one causing hyperglobulinemia, the other hypoalbuminemia (for instance, lymphopathia venereum and chronic nephritis, *Table 3*).

Hyperproteinemia (above 7.5 grams) means almost invariably hyperglobulinemia. In the author's study, in which the cases were selected because they were suspected of possible blood protein changes, hyperproteinemia was found in less than 10 per cent of all the analyses.

Recent work indicates that the reticulo-endothelial system may be the site of origin of globulin, and diseases involving this system form

HYPOPROTEINEMIA

(1) *Malnutrition*
- Dietary
  - (a) Endemic and sporadic
  - (b) Associated with chronic infection, pellagra, beriberi, etc.
- Poor absorption
  - (a) Idiopathic?
  - (b) Diarrhea
  - (c) Intestinal fistulae
  - (d) Cancer of stomach, pancreas
- Poor utilization?
  - (a) Pernicious anemia, uncontrolled
  - (b) Diabetes mellitus, unregulated

(2) *Kidney Diseases*
- Nephroses—all types
- Glomerular nephritis, chronic
- Amyloid kidney

(3) *Liver Diseases*
- Cirrhosis
- Cancer

(4) *Protein Dilution*
- Excess fluid administration

(5) *Protein Loss*
- Hemorrhage, acute or chronic
- Weeping wounds or skin lesions
- Shock, surgical and traumatic

(6) *Heart Failure*

(7) *Hyperthyroidism*

(8) *Chronic Poisoning*
- Benzene, carbon tetrachloride
- War gas (phosgene)
- Phosphorous

(9) *Toxemias of Pregnancy*

Table 2

CONDITIONS CAUSING HYPERGLOBULINEMIA AND HYPOALBUMINEMIA SIMULTANEOUSLY

(1) *Liver diseases*
- (A) Cirrhosis
  - (a) Primary
  - (b) Secondary to heart failure
- (B) Cancer
  - (a) Primary
  - (b) Metastatic

(2) *Acute glomerular nephritis*

(3) *Combination of two diseases, the one causing increased globulin, the other decreased albumin, as*
- (A) Increased globulin
  - (a) Syphilis
  - (b) Tuberculosis
  - (c) Lymphopathia venereum
  - (d) Periarteritis nodosa
  - (e) Subacute bacterial endocarditis
  - (f) Multiple myeloma
- (B) Decreased albumin
  - (a) Nephritis
  - (b) Malnutrition
  - (c) Diarrhea

Table 3

a convenient group, each causing hyperproteinemia. Of these, monocytic leukemia, multiple myeloma, and kala azar cause the highest values for total serum protein concentration which are recorded. The total protein concentration in multiple myeloma has been found to be as high as 23.4 grams and in monocytic leukemia as high as 10.1 grams.

Determination of blood proteins in multiple myeloma is said to be more valuable as an aid in diagnosis than the search for Bence-Jones protein in the urine. Ulrich finds that it is frequently present in the absence of Bence-Jones protein. The level is said to increase as the disease progresses.

There are also reports in the literature of comparatively small increases in the serum globulin in lymphoid and myeloid leukemia and in carcinomatous metastasis to bone marrow and liver.

In most patients where hyperproteinemia exists it is due to infection and this is mostly of a suppurative or chronic nature. These include bronchiectasis, lung abscess, tuberculosis, syphilis, chronic osteomyelitis, chronic pyonephrosis, Boeck's sarcoid, leprosy, rheumatoid arthritis, lymphopathia venereum, subacute bacterial endocarditis, lupus erythematosis disseminata, and periarteritis nodosa. Except for lymphopathia venereum, subacute bacterial endocarditis, Boeck's sarcoid and pulmonary suppuration, the increase of globulin in these cases is not usually very marked and the total protein concentration is seldom over 9.0 grams. A few diseases which are rare in this country, such as filariasis, trypanosomiasis, and schistosomiasis, may also produce increased globulin concentration.

It is doubtful whether the increase in globulin in these conditions is due entirely to increase in immune bodies in the blood. The increase may be the result of antibody antigen interaction and may not be active antibody. Here is a ripe field for investigation.

In dehydration one would expect an increased concentration of blood proteins both albumin and globulin. However, the albumin is increased only temporarily in the early stage of dehydration, after which globulin continues to increase

HYPERPROTEINEMIA

(1) *Dehydration*
- Insufficient intake
- Fluid loss
  - (a) Intestinal obstruction and fistulae
  - (b) Diarrhea, especially infants
  - (c) Cholera
  - (d) Diabetic acidosis
  - (e) Vomiting
  - (f) Burns
  - (g) Heat cramps and heat exhaustion
  - (h) Fulminant infections
  - (i) Addison's disease

(2) *Diseases involving Reticulo-endothelial system*
- Multiple myeloma
- Monocytic leukemia

(3) *Infections, Chronic*
- Suppurative
- Ulcerative tuberculosis
- Syphilis
- Lymphopathia venereum
- Subacute bacterial endocarditis
- Periarteritis nodosa
- Lupus erythematosis
- Rheumatoid arthritis
- Boeck's sarcoid
- Malaria
- Leprosy
- Kala azar
- Schistosomiasis
- Filariasis
- Trypanosomiasis

(4) *Liver Disease*
- Cirrhosis of liver, early
- Primary cancer of liver

Table 4

and albumin remains stationary or falls, the latter perhaps due to diarrhea, infection, or whatever may be the fundamental cause of the dehydration. Albumin concentration rarely exceeds 5.0 grams. This suggests that perhaps there is some mechanism within the body which destroys albumin when its concentration exceeds a certain point. Talbott suggested that an increase in capillary permeability during dyhydration might cause a loss of the albumin fraction. Further investigation is needed on this point.

Many patients with dehydration, when given fluid, develop edema. This is easily understood if one realizes that albumin is lost as blood concentration occurs; then when blood volume is restored by physiologic saline or similar fluid, the remaining albumin is diluted to a point where there is insufficient osmotic pressure within the blood to prevent edema formation. This can be avoided by choosing a fluid, such as plasma, when it is thus indicated.

Thus we find hyperglobulinemia or hyperproteinemia in four distinct groups: (1) dehydration, (2) diseases involving the reticulo-endothelial system, (3) liver diseases, (4) infections (see *Table 4*). The total protein concentration is rarely above 9.0 grams in conditions other than multiple myeloma, lymphopathia venereum, and dehydration and in a few less common diseases discussed above. The fact that it is increased above normal may be very helpful in differential diagnosis involving these diseases and in the treatment of dehydration.

INTESTINAL PARASITES AND SKIN DISEASES*

By M. T. VAN STUDDIFORD, M.D.
New Orleans, Louisiana

When the cause of a skin disease is known it usually bears a fancy name. When the cure and the cause are unknown, it is usually the advertiser's friend. And when it is just a skin condition, it is listed as an eczema.

Skin diseases deviate from the standard in one locality and another as do climate, altitude, longitude, and atmospheric findings. Thus a disease in the high dry mountains and the wet marsh lowlands varies, as do schools and methods of treatment. So that it follows that what is effective therapy for one dermatologist does not work for his distant colleague. Few border on the perfection of curing all diseased skin conditions. Many of us find that occasionally we are confronted with patients to whom a change of locale would be of benefit, not only to the patient but to the physician.

For those of us who practice dermatology in that portion of the United States where intestinal parasitic infection is more common than in other sections of this expansive country, the need to ascertain the presence or absence of these infections in skin diseases is of greater importance than in other sections.

Foci of infection have been shown to cause or exaggerate some skin diseases which are common to all countries. Of this group I have selected chronic acne, rosacea, seborrheic dermatitis, alopecia areata, pompholyx of the hands and feet, with reference to the "ids," pustular psoriasis (so-called) and chronic urticaria. All intestinal parasites will not be considered in this paper because I am confining myself to the recital of my own clinical experiences and am not discussing the complete list of intestinal parasites.

The element of cure of any of the above named skin diseases may be frustrated by the inability to find a focus from which toxins or devitalizing substances are disseminated. When the usual examination by observation fails, when sinuses, mouth, throat, prostate, cervix, and hemorrhoids are free of infection, when an occasional chronic mastoiditis or infected heart valve is not demonstrable, often a painstaking stool examination will offer the clue to the solution of the causative agent. No patient should be abandoned without this study. For that reason, the results of my search of the stools in some cases will be listed, with a brief mention of the common intestinal parasites confronted and the conclusions drawn therefrom. The mode of transmission, processes involved, the etiology of many of the diseases mentioned, are far beyond my ability to explain. So be content with the recording of events and the facts that were found.

UNCINARIASIS

One of the etiological agents in the cause of alopecia areata is listed in texts as foci of infection. I have in mind a father and a 7-year-old son from a manufacturing community in Mississippi. During their first attack of alopecia areata, a routine county hookworm round-up was being made. Both were examined, found infected, and were treated for hookworm with

*Chairman's Address, Section on Dermatology and Syphilology, Southern Medical Association, Thirty-Sixth Annual Meeting, Richmond, Virginia, November 10-12, 1942.

the resultant return of normal hair. Three years later, each developed the second attack. On examination of their stools, both were found to be again infected. Treatment was once more followed by a return of hair. No history could be obtained of the therapeutic use of drugs previous to the attacks.

A young lady of 22, from the Natchez, Mississippi community, consulted me for a chronic acne. In the course of various types of examination, a positive hookworm infection was diagnosed. She promptly got well of her acne after receiving hookworm treatment.

Hookworm anemic ulcerations of the legs are occasionally seen in Charity Hospital, but it is interesting to record that only three cases positively diagnosed as hookworm have been found in all the patients who have been examined in my private practice. One would expect a high proportion of positive stools to be found of the hookworm infection, but such is not the fact. Likewise, only one tapeworm infection was found, that of a young lady of 19 years, who, following treatment, recovered from a persistent chronic acne.

E. COLI AND E. HISTOLYTICA

My purpose in listing Endameba histolytica and Endameba coli together is to bring out the belief that when E. histolytica cysts are found in a stool specimen, the case is a known positive, but when specimens are repeatedly positive to E. coli alone, those cases should be considered as more than probably E. histolytica positive as well, and should be treated as such. I have followed this opinion in my practice. This is done because a close friend who is a medical colleague of mine suggested that in those stool specimens in which only E. coli are found, if complete and painstaking examinations are repeated over a period of time, a goodly percentage will finally be diagnosed by the finding of the accompanying E. histolytica. Therefore, in my practice, positive E. coli infections are treated with the anti-amebic drugs.

E. histolytica and E. coli have been found associated in the stools of patients suffering from: acne, seborrheic dermatitis, pompholyx, the "ids," chronic urticaria, and pustular psoriasis (so-called).

Chronic acne, and acne with recurrences in persons past adolescence, rosacea, seborrheic dermatitis, pompholyx, the "ids," pustular psoriasis (so-called), should be investigated as intestinal infection suspects, when foci of infection cannot be found in the sinuses, the chronic mastoid, the mouth, throat, prostate, cervix, hemorrhoids, gallbladder or heart valve infection. Painstaking, skilled technical laboratory procedure is the fly in the ointment at this juncture of this discussion. Few are found because more than often they are not seen by the average laboratory worker. Therefore, practice and instruction in the search for the cysts must not be overlooked.

The importance of clearing up a chronic affection must be taken for granted. This would be especially true, for example, in a seborrheic dermatitis when the ophthalmologist wishes to operate upon a patient for cataracts, when scleral and corneal irritation would be produced by so-called seborrhea. Local applications, the vitamins, and especially the riboflavin factor, are of great value, but eradication of foci must be accomplished most often for permanent relief and the proper stimulation of the oil glands.

Pompholyx, with the "ids" as viewed by an increasing number of the present day writers, has been separated from the fungi school and placed in the foci of infection class. Attacks of the affection may be chronic with mild exacerbations every day or so; or the affection may be occasional with severe vesicular outbreaks during times of stress and strain or during extreme weather changes, or those that follow a hot automobile trip. The lesions tend to have fixed areas of predilection. There is often a nervous element that accompanies the attack. This might possibly result because the outpouring of toxins which causes the attacks of pompholyx also causes the accompanying nervousness. It would then be as hard to say which came first as to answer the question of the hen or the egg.

In the routine search for the foci of infection causing pompholyx and the so-called "ids," a number of positive E. histolytica and E. coli infections have been found. As to whether pustular psoriasis, so-called, is an entity or a drying, chronic, deep set, crusted pompholyx or not, I would say that all cases I have ever seen labeled pustular psoriasis gave me the impression that they were pompholyx. I have in mind a lady, the wife of an American diplomat, who had been treated by dermatologists in the Eastern cities, and who was referred to me from Washington, D. C. During her stay in Louisiana, a positive E. histolytica infection was diagnosed, and following treatment she has, according to her Washington, D. C. dermatologist, been cured by anti-amebic therapy.

Chronic urticaria with mild or severe attacks

can most often be traced to a nervous origin, but two patients whom I saw this year have remained free of attacks following a diagnosis of E. histolytica and E. coli, respectively, with the subsequent institution of anti-amebic treatment.

Amebic ulcers of the skin are rare. Engman and Melaney report a case, and one was seen in our service at Charity Hospital, but mention is made of them here in order to complete the picture of the ameba as a skin offender. Discussion of these ulcers does not enter into the scope of this paper.

CASE REPORTS

Mrs. R. H. E., Jr., of New Jersey, was treated from February, 1936, for vesicles and crusting of the skin on the fingers of both hands. Tests for tricophyton, 1/30, were negative; oidiomycin, 1/100, negative; patch tests and scratch tests, all were negative. In April, 1941, she was examined and given routine x-ray and wet pack therapy. In June, 1941, Endameba histolytica was found. Following treatment, she has remained well.

Sister W., a nun, aged 50, was treated for pompholyx in St. Louis, in Illinois, and in Louisiana, over a period of years. E. histolytica and E. coli were found January 25, 1941. She has remained well since completion of anti-amebic therapy.

Mrs. W. B., treated for a severe rosacea, was five months pregnant and positive for E. coli. The skin condition has cleared and she has remained well since anti-amebic therapy. What effect the pregnancy had on the rosacea is to be questioned, but the patient was free of rosacea before parturition.

Mrs. C. T., a Mexican lady, lived in Louisiana and in Cuba during sugar harvests. She had acne of the temples and cheeks. E. histolytica and E. coli demonstrated on examination were positive November 9, 1940. She was treated and the acne healed. Stools were negative until December 4, 1941, when the acne returned, and was healed following a second course of therapy.

L. F., a young lady, had chronic papular urticaria. E. coli cysts were found June 18, 1940. She was treated for amebic infection and has remained well of the urticaria.

From these brief statements and case histories are we to draw the conclusion that it is worth the time and effort to study fifty stool specimens in the hope of finding one positive infection, which may or may not be the cause of our patient's dermatitis? Or are we to conclude that just any hurried routine examination of a stool specimen by the rank and file of laboratory technicians is going to find one out of fifty? Should we become biased enough to treat a patient who has had two positive E. coli stool specimens with the routine treatment for E. histolytica. Or are we to forget that many of the patients studied had the same diseases but that we failed to find intestinal parasites? One should not try to be dogmatic or one-track-minded about the value of well studied stool examinations, but I hope that I have shown the help that can be afforded to many patients by these examinations.

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M. Y. DABNEY, M.D., Editor
C. P. LORANZ, Secretary, Treasurer and General Manager

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EDITORIAL DEPARTMENT

DYSMENORRHEA

With the advent of the Aschheim-Zondek pregnancy test, urinary excretion of the hormones was demonstrated to be a matter of prime physiologic importance. It was soon noted that the chorionic gonadotropic hormone (the anterior pituitary-like) was enormously high in hydatid mole, and often greatly elevated in diabetic pregnancies; and that a very high gonadotropic content in pregnancy urine was apt to indicate an abnormal gestation. The Smiths[1] of Brookline, Massachusetts, and their associates have made a number of enlightening studies upon the significance of quantitative variations of hormones in pregnancy. They note a rise of APL several weeks before symptoms of beginning eclampsia. Characteristic changes in the urinary estrogens also they say, indicate early eclamptic stages, and they interpret these changes as indicative of a deficiency of progestin in the pre-eclamptic patient. When they treated patients of this type with progesterone and estrogens, a return toward normal in hormone excretion and clinical symptoms was observed, which, however, lasted only a few days. Within a week the treatment ceased to be effective. Somewhat similar results in these cases were obtained with adrenal cortical hormone. Though ovarian action seemed to be deficient, they could not repair it by ovarian hormones.

The same workers[2] investigated estrogen excretion in cases of essential dysmenorrhea. They interpret their findings as indicating progestin deficiency throughout the cycle of the dysmenorrheic patient, and arising from lack of adequate luteal development in the ovary.

Bickers,[3] in a paper in this issue of the *Journal*, discusses the effect of progesterone upon dysmenorrhea, from the point of view of its effect upon uterine contractions which have been stimulated by posterior pituitary hormone. The dysmenorrheic uterus, he says, is one which has been thrown into spasm and does not relax between contractions as the normal uterus should. The lack of a rest interval between contractions interferes with the normal oxygenation and nutrition of the myometrium. Muscle contraction in the presence of anoxia is associated with pain; uterine anoxia caused by spasm results in pain (like the muscle anoxia of angina pectoris) and constitutes the pathologic physiology of dysmenorrhea. This theory of the origin of menstrual pain is of interest as are the various series of balloon and kymograph recordings of human uterine contractility which, Bickers[3] says, is not affected by progesterone.

Evidence presented by the Smiths would suggest that dysmenorrhea is the result, not of an immediate failure of one physiologic material to inhibit contractions or of another to make them continuous (produce uterine spasm and anoxia) during painful menses; but rather to an abnormally prepared endometrium which has resulted from defective ovarian secretion throughout the

1. Smith, O. Watkins; Smith, George Van S.; and Schiller, Sarah: Clinical Experiments in Relation to the Excretion of the Estrogens. Amer. Jour. Obst. and Gynec., 45:15 (Jan.) 1943.

2. Smith, O. Watkins; Smith, George Van S.; and Gauld, A. Gordon: Effect of Veratrum Viride upon Urinary Estrogens in Pre-Eclampsia. Ibid., p. 23.

3. Bickers, William: Primary Dysmenorrhea. South. Med. Jour. This issue, p. 192.

month, not merely at the painful moment. They infer an ovarian deficiency, more specifically a luteal deficiency, active over the period of the cycle or perhaps necessarily much longer, and resulting in a uterus which is improperly prepared for menstruation. Presumably the spasms of the dysmenorrheic uterus should be treated before they occur, rather than with an endocrine product during cramps.

Continuation of such studies as these upon the urinary excretion and endocrine balance of the individual will throw more conclusive light upon many gynecologic conditions.

WOOL AND HOOFS AS FEEDSTUFFS

With the current prospects of famine for man and beast, new sources of nutritive materials are eagerly to be sought. Well known investigators of the University of Wisconsin College of Agriculture[1] have studied the utilization of keratin, from hoofs and horns, to support growth of young rats and chickens. Powdered hog hoofs were collected at a packing plant and examined chemically and biologically by feeding them to young animals and fowls over a period of about a month as a source of protein. They promoted growth of rats almost as well as did casein, if considerably larger quantities were administered. If a small quantity of casein was given with the keratin, better nutrition was obtained. The powdered hoofs also promoted growth of chickens fairly successfully. The chickens developed a characteristic gizzard lesion. It was concluded that keratin is digestible and a usable source of protein, but is deficient in certain of the amino acids, which make perhaps the limiting factor in its utilization. Hoofs seemed to be a better source of protein than wool or feathers; and hoofs alone as protein were actually better for chickens than casein alone, which is milk protein. Hoofs would thus appear to have value as a possible animal food.

The war may make necessary the consumption of hitherto little used foods; certainly definite changes in the American dietary habit will occur. Chemists will perhaps offer as progressive aid in the development of new or emergency sources of food, as they have provided in the exploitation of vegetable plastics for construction or for household conveniences.

1. Wagner, Joseph R.; and Elvehem, C. A.: Nutritive Value of Keratins. I. Powdered Swine Hoofs. Proc. Soc. Exper. Biol. and Med., **51**:394 (Dec.) 1942.

CARBOHYDRATE AND THE LIVER

"Life depends upon the liver" is an aphorism from early times, which perhaps originated when the first autopsies demonstrated the large size of this organ in the abdominal cavity. Later studies have proved its countless physiologic functions. Diet is believed to influence its condition very rapidly.

It has been customary to advise a high carbohydrate diet before an operation to prevent liver injury from chloroform or other poisons, or to improve the status of a patient with impaired liver function. Obstetricians likewise are inclined to recommend a high carbohydrate diet in pregnancy, to prevent the development of toxemia. According to Ravdin[1] and associates of Philadelphia, clinicians in this country believe that such a ration offers direct protection of the liver from the necrotizing effects of chloroform; that a high concentration of liver glycogen in itself protects the liver from injury from a wide variety of agents; that the detoxifying power of the liver is proportional to its glycogen content; and that hepatic regeneration will proceed more rapidly on a high carbohydrate diet than on any other. An outgrowth of this idea was the intravenous administration of dextrose to prepare the bad risk liver patient for operation. Ravdin believes that the glycogen content of the liver does not increase on carbohydrate unless the patient is receiving adequate calories, which he cannot obtain by the intravenous route. By preliminary treatment over several days with a diet of adequate caloric and protein content,

1. Ravdin, I. S.; Thorogood, E.; Riegel, C.; Peters, R.; and Rhoads, J. E.: The Prevention of Liver Damage of the Facilitation of Repair in the Liver by Diet. J.A.M.A., **121**:322 (Jan. 30) 1943.

the glycogen of such patients could be elevated and the lipid content decreased. Before operation the Philadelphia workers gave protein mainly in the form of casein; after operation, it was given as calves' liver, which is reported to facilitate regeneration of liver most rapidly.

Hough and Freeman,[2] of Northwestern University Medical School, have recently investigated liver function and diet in the laboratory, from a somewhat different viewpoint. Diets deficient in protein, they say, produce changes in function and structure of the liver cells. Dogs maintained on a protein-free diet showed a decrease in the hepatic clearance of rose bengal, that is, a decreased ability of the liver to remove this dye from the blood stream after intravenous injection. This is one of the accepted liver function tests. There was thus an injury to the liver of the animals by the protein-free ration. The serum phosphatase level, they say, may be a delicate indicator of liver function. This enzyme rises in the blood stream in certain types of liver damage, from chemical, mechanical and bacterial agents. It rose in the dogs on low protein diet, and was apparently an early indicator of injury to the liver. These changes could be reversed by adding either casein or cooked egg white to the experimental ration.

The workers at Northwestern thus again emphasize the importance of protein in maintenance of liver function. Most recent nutritional studies have indicated the importance of protein in growth and maintenance. Vitamins are not mentioned in the studies reported above. However, liver is one of the best known sources of many vitamins. Its value in stimulating regeneration of liver tissue might easily be as much in its accessory food factors as in its protein content. The tendency of nutritional work everywhere is to recommend many supplements to the high carbohydrate diet which has for years been popular because it is cheap.

2. Hough, Victor H.; and Freeman, Smith: The Effect of a Protein-Deficient Diet on the Serum Phosphatase and Hepatic Dye Clearance of Dogs. Amer. Jour. Physiol., **138**:184 (Dec.) 1942.

TWENTY-FIVE YEARS AGO

From Journals of 1918

Alabama News.[1]—During the month of February there was an epidemic of smallpox in Jefferson County.

Dr. W. Earle Drennen, Birmingham, has recently received the commission of Major in the M.R.C. and has gone to New York, N. Y., for a special course in brain surgery. * * *

Health Officer Carl A. Grote, of Madison County, announces that the Delineator Company of New York will make a health survey of Huntsville in an endeavor to ascertain the cause of the high infant mortality of that city. * * *

Arkansas News.—State Health Officer C. W. Garrison reports that the smallpox epidemic is well under control, but urges vaccination as a valuable phophylaxis. * * *

Mississippi.—The Delineator Company of New York will conduct a health survey of Meridian in co-operation with Dr. W. A. Carpenter, City Health Officer.

Missouri.—An epidemic of smallpox has existed in Kansas City for some weeks.

Oklahoma.—City Health Officer of Henryetta announces that an epidemic of smallpox exists in that city and vicinity.

Advertisement.[2]—Use Vaccines in acute infections. The early administration of Sherman's bacterial vaccines will reduce the average course of acute infections like pneumonia, sepsis, erysipelas, mastoiditis, rheumatic fever, colds, bronchitis, etc., to less than one-third the usual course of such infectious diseases.

1. Southern Medical News. South. Med. Jour., **11**:261 (March) 1918.

2. Adv. ibid., p. 32.

Book Reviews

Infant and Child in the Culture of Today: The Guidance of Development in Home and Nursery School. By Arnold Gesell, M.D., Director of the Clinic of Child Development School of Medicine, Yale University; Frances L. Ilg, M.D., Assistant Professor of Child Development in collaboration with Janet Learned, M.A., Principal of the Guidance Nursery; and Louise B. Ames, Ph.D., Research Assistant. 399 pages. New York and London: Harper & Brothers, Publishers, 1943. Cloth $4.00.

A more timely book has seldom come off the press. More children are now being cared for in nursery schools and day care centers than ever before and for their caretakers this material, concerning effective guidance and wise psychological care, will be indispensable. The book is so simply written that it will be as serviceable to the mother, caring for her child in her own home, as to the professionally trained nursery school teacher.

The information is based upon years of systematic

research and careful observation in the Clinic of Child Development of the School of Medicine, Yale University.

The first of the three sections of the book deals with the growth of the child in the culture of today and explains the intricate "tongue and groove" relationship of maturation and acculturation. Part two, the main body of the book, concerns itself with factual data regarding growth characteristics of the first five years of life. In the twelve age periods discussed, the most typical traits of growth for each period are described and summarized. Part three returns to a consideration of the broad problem of growth guidance for which practical part two has laid the foundation.

This book is readable and is almost encyclopedic in its scope. It takes into account the physical, mental and social growth patterns without over focus on any one particular pattern. It should prove valuable to anyone concerned with the training and development of children, whether in the professional or lay field.

A Textbook of Fractures and Dislocations Covering Their Pathology, Diagnosis and Treatment. By Kellogg Speed, S.B., M.D., F.A.C.S., Professor of Surgery (Rush) of the University of Illinois. Fourth Edition. Thoroughly Revised. 1,106 pages, illustrated. Philadelphia: Lea & Febiger, 1942. Cloth $12.50.

The author's revised fourth edition is a very comprehensive book including material of interest to the fracture specialist and orthopedic surgeon. Most of the described methods of obtaining traction are still in vogue, but several have been supplemented by newer and simpler devices. The author still advocates the use of saline solution and epinephrine in the treatment of shock, a method generally believed to be inadequate.

A departure from the usual fracture text is the use of line drawings and sketches to depict the type of fracture rather than the use of x-ray reproductions. While this is useful for teaching purposes, yet the surgeon loses the value of comparing his x-ray film with those ordinarily pictured in the texts. The photographs are generally good.

There are presented a number of orthopedic procedures, such as eight different operations for recurrent dislocation of the shoulder, diagnosis of intervertebral disk protrusions, operative treatment of recurrent patella dislocations, and so on, which are not necessarily expected to be presented in a text dealing with fractures. The author's presentation of his clinical and teaching experience at Cook County Hospital, together with his description of fractures and dislocations, makes this a valuable reference book.

Eat What You Want! A Sensible Guide to Good Health Through Good Eating. By W. W. Bauer, M.D., Director, Bureau of Health Education, American Medical Association, Associate Editor *"Hygeia,"* and Florence Marvyne Bauer, with an Introduction by Morris Fishbein, M.D. 263 pages. New York: Greenberg, Publisher, 1942. Cloth $2.00.

"Eat What You Want" is an engagingly written, nontechnical text on nutrition which is well adapted to the current effort to establish sound dietary habits in the American people despite wartime food restrictions. The authors are in no way dictatorial, but classify foodstuffs into groups according to composition, outline the basic requirements for adequate nutrition, and then illustrate the manner of meeting these requirements by building menus through the selection of foods in proper number and quantity from each of the essential groups. The volume strikes hard at extremists and faddists, emphasizes that no single food is of itself good or bad, and points out that each class of food essentials allows so wide a choice that it is easily possible to eat what you want while attaining good nutrition. By presenting skeleton master menus and discussing the nutritive adequacy of tabulated meals for 25 days, the authors impart to their readers the fundamental principles of nutrition and knowledge of food groups. Housewives particularly will find of value the sections on cookery, marketing and preparation of lunches.

The reviewer highly recommends the volume for physician's reception rooms and use in nutrition classes. Its worth is hardly lessened by the fact that the careful reader may note that the sample menu lists one slice of bread as containing 20 grams of carbohydrate and one ham sandwich only 13.5 grams.

Endocrinology: Clinical Application and Treatment. By August A. Werner, M.D., F.A.C.P., Assistant Professor of Internal Medicine, St. Louis University School of Medicine. 924 pages. Philadelphia: Lea & Febiger, Publisher, 1942. Cloth $10.00.

The past decade has been especially fruitful in the endocrine field, not only in fundamental advances in the laboratory, but also in the pharmaceutical preparation of potent products, many synthetic, for therapeutic use. The present second edition of Dr. Werner's text incorporates this new knowledge and fresh therapeutic experience to bring the work fully up to date.

The style makes for pleasant reading and there is an admirable balance between the presentation of underlying anatomy and physiology and their correlation with clinical disease states and associated symptoms, diagnosis and treatment. The author is fair-minded, conservative and draws freely from recent endocrine literature.

While the chapters devoted to diabetes and hyperinsulinism are sketchy and perhaps outmoded, still the sections on the pituitary, the gonads, and the thyroid comprise the bulk of the book and are most satisfactory. In addition to chapters treating each of the endocrine glands, the text includes sections on the autonomic nervous system, calorimetry, diseases affecting osseous metabolism, the skin, the hair and the teeth.

Most physicians who read Dr. Werner's text will do so with pleasure and profit.

Silent Enemies: The Story of the Diseases of War and Their Control. By Justina Hill. 266 pages. New York: G. P. Putnam's Sons, 1942. Cloth $2.50.

The subject matter of this book is confined to infectious diseases. Historical epidemiology, prophylactic and curative treatment are discussed. The diction is well chosen so that the layman who reads it can understand and be interested in the adaptation of medical science to the prevention and cure of diseases which are often associated with the congregation of large numbers of people. Both physical and chemical wounds and trauma are also discussed. Each section shows professional knowledge and careful study.

Southern Medical News

ALABAMA

Medical Association of the State of Alabama will hold its next annual meeting at Birmingham, April 20-22.

Hillman Hospital, Birmingham, a charity hospital, will have the following physicians as heads of the various services, all serving without compensation: Dr. James S. McLester, Director, Medical Services and Physician-in-Chief; Dr. Henry R. Carter, Jr., Associate Director, Medical Services; Dr. J. M. Mason, Surgeon-in-Chief Emeritus; Dr. David S. Moore, Director, Surgical Services and Surgeon-in-Chief; Dr. S. G. Stubbins, Chief, Section on Gynecology; Dr. Walter F. Scott, Chief, Section on Urology; Dr. John D. Sherrill, Chief, Section on Bone and Joint Surgery; Dr. F. H. Thomas, Chief, Section on Ophthalmology; Dr. James R. Garber, Chief, Section on Obstetrics; Dr. T. M. Boulware, Associate Chief, Section on Obstetrics; and Dr. C. J. Colquitt, Chief, Out-Patients Department.

Dr. James S. McLester, Birmingham, has been appointed Chairman of the Advisory Council on Health of the United States Chamber of Commerce.

Dr. Caroline H. Callison, Chatom, is serving as Health Officer of Washington and Clarke Counties.

Dr. Elisha Moore, Livingston, Health Officer of Sumter County, has been placed in charge of the Greene County Department of Health.

Dr. Julius E. Dunn, Florence, is Health Officer of Etowah and Calhoun Counties with headquarters in Anniston.

Dr. James Lafayette Jordan, Jr., and Miss Mary Katherine Boswell, both of Huntsville, were married recently.

Dr. Howard Bailey Williams and Mrs. Betty Carlson Lide, both of Birmingham, were married recently.

Deaths

Dr. Bethea Portis Brindley, Danville, aged 87, died recently of pneumonia.

Dr. Henry Trawick Donovan, Huntsville, aged 35, died recently of injuries received in an automobile accident.

ARKANSAS

Arkansas Medical Society will hold its next annual meeting at Little Rock, April 19-20.

Crawford County Medical Society has elected Dr. B. B. Bruce, Alma, President; Dr. J. R. Crigler, Alma, Vice-President; and Dr. S. D. Kirkland, Van Buren, Secretary-Treasurer.

Fifth Councilor District Medical Society has elected Dr. S. J. McGraw, El Dorado, President; Dr. Rowland Robins, Camden, Vice-President; and Dr. G. F. McLeod, Magnolia, Secretary.

Green County Medical Society has elected Dr. J. J. Hudgins, President; Dr. J. A. Dillman, Vice-President; and Dr. W. McD. Lamb, Secretary-Treasurer, all of Paragould.

Jefferson County Medical Society has elected Dr. W. H. Bruce, President; Dr. B. D. Luck, Jr., Vice-President; and Dr. Fred Hames, Secretary-Treasurer, all of Pine Bluff.

Little River County Medical Society has elected Dr. E. R. King, Ashdown, President; and Dr. Pat Hamm, Secretary-Treasurer.

St. Francis County Medical Society has elected Dr. H. L. McClendon, Palestine, President; Dr. A. B. Caldwell, Forrest City, Vice-President; and Dr. J. O. Rush, Forrest City, Secretary-Treasurer.

Saline County Medical Society has elected Dr. Dewell Gann, Sr., President; and Dr. C. W. Jones, Secretary-Treasurer, both of Benton.

Dr. Paul Gray has been elected City Health Officer at Batesville.

Dr. A. F. Hoge, Fort Smith, has been elected Director of the City National Bank.

Dr. W. B. Grayson, Dr. H. Fay H. Jones, Dr. J. D. Riley and Dr. A. C. Shipp, all of Little Rock except Dr. Riley of State Sanatorium, have been appointed a commission to study plans for a more adequate control of tuberculosis.

Dr. J. H. Burge, Lake Village, has been elected a Fellow of the American College of Surgeons.

Dr. C. P. Harris has moved from Leachville to Jonesboro.

Dr. A. L. Carter is building a hospital at Berryville.

Dr. C. S. Early, Camden, has been elected a Director of the Merchants and Planters Bank.

Dr. W. E. Ellington, Paragould, has been elected Director of the Security Bank and Trust Company.

Dr. J. B. Askew, Little Rock, has accepted appointment with the U. S. Public Health Service and is stationed at San Francisco, California.

Dr. J. Harry Hayes and Dr. J. Donald Hayes, of Little Rock, and Dr. Ralph E. Crigler, Dr. T. P. Foltz, Dr. Carl L. Wilson and Dr. S. J. Wolferman of Fort Smith, were recently elected Fellows of the American College of Surgeons.

Dr. L. J. Kosminsky, Texarkana, has been appointed Medical Officer on the Regimental Headquarters Staff of the Arkansas State Guard.

Dr. H. V. Stewart, formerly of Little Rock, is now located at Deaconess Hospital, Milwaukee, Wisconsin.

Dr. Grace Claire Allnutt, Little Rock, and Dr. C. H. Beasley, Lieutenant, Medical Corps, U. S. Army, Washington, D. C., were married recently.

Dr. W. O. Loftis, Captain, Medical Corps, U. S. Army, formerly on duty with the Induction Station, Little Rock, has been transferred to the Induction Station at Abilene, Texas.

Deaths

Dr. J. L. Griffin, Vanndale, aged 67, died recently.

Dr. Richard T. Henry, Springdale, aged 62, died recently of coronary thrombosis.

Dr. W. J. Hutto, Bee Branch, aged 71, died recently of arteriosclerosis.

Dr. Hendric Arnold Ross, Arkadelphia, aged 58, died recently.

Dr. William A. Snodgrass, Little Rock, aged 68, died recently.

Dr. Robert Lee Smith, Melbourne, aged 66, died recently of gout and uremia.

DISTRICT OF COLUMBIA

Conference of State and Provincial Health Authorities of North America will meet at Washington, March 22-25.

The Children's Hospital, Washington, has received a check for $1,500 which completes the endowment of a room by the American Newspaper Women's Club.

Dr. Edgar A. Bocock, Washington, Superintendent of Gallinger Hospital, was honored by the hospital staff recently and presented with a number of gifts to commemorate his fifteenth anniversary as head of the Hospital. Dr. Bocock stated that fifteen years ago the Hospital could accommodate only 200 patients and now when a building under construction is completed it will be able to care for approximately 1,600 patients.

Dr. Fred W. Rankin, Colonel, Medical Corps, U. S. Army, Senior Consultant in Surgery, Washington, has been created temporary Brigadier General.

Deaths

Dr. George Harris Richardson, Washington, aged 88, died recently.

Dr. John Lewis Riggles, Washington, aged 63, died recently.

Dr. Leslie Tanquary Rusmiselle, Washington, aged 53, died recently.

Dr. Edward Raymond Stone, Jr., Washington, aged 29, was killed in action in the Middle East while in front line duty with the attacking forces during the advance in Egypt.

Dr. William Douglas Wirt, Washington, aged 80, died recently.

FLORIDA

Broward County Medical Society has elected Dr. D. W. Harris, President; Dr. Robert Blessing, Vice-President; and Dr. O. C. Brown, Secretary-Treasurer, all of Fort Lauderdale.

DeSoto-Hardee-Highlands-Charlotte-Glades County Medical Society has elected Dr. M. C. Kayton, Wauchula, President; and Dr. C. H. Kirkpatrick, Arcadia, Secretary-Treasurer.

Duval County Medical Society has installed Dr. T. Z. Cason, President; and has elected Dr. J. G. Lyerly, President-Elect; Dr. W. H. Brooks, Vice-President; Dr. F. A. Copp, Secretary; and Dr. John A. Beals, Treasurer, all of Jacksonville.

Escambia County Medical Society has elected Dr. Alvyn W. White, Pensacola, President; Dr. John K. Turberville, Century, Vice-President; and Dr. Lee Sharp, Pensacola, Secretary-Treasurer.

Hillsborough County Medical Society has elected Dr. T. C. Maguire, Plant City, President; Dr. R. R. Duke, Tampa, Vice-President; and Dr. James S. Grable, Tampa, Secretary-Treasurer.

Manatee County Medical Society has elected Dr. M. M. Har-

rison, President; Dr. J. F. Mason, Vice-President; and Dr. L. W. Blake, Secretary-Treasurer, all of Bradenton.

Pasco-Hernando-Citrus County Medical Society has elected Dr. W. Wardlaw Jones, Dade City, President; Dr. Claude L. Carter, Inverness, First Vice-President; Dr. W. H. Walters, Locoochee, Second Vice-President; and Dr. G. R. Creekmore, Brooksville, Secretary-Treasurer.

Polk County Medical Society has elected Dr. T. G. Simmons, Auburndale, President; Dr. J. G. Gilchrist, Bartow, Vice-President; and Dr. Edgar Watson, Lakeland, Secretary-Treasurer.

Dr. William H. Watters, Coconut Grove, and Boston, Massachusetts, was nominated as Associate in Legal Medicine at a recent meeting of the Medical Faculty of Harvard University. Dr. Watters will continue as in the past to have charge of and direct the postgraduate work of the Department as well as to conduct research work during the summer. He will also continue as Associate Medical Examiner of Suffolk County (Boston), a position held by him for many years.

Three of the largest hotels at Miami Beach, the Pancoast, the Tower and the Gulf Stream Apartments, have been taken over by the War Department for conversion into hospitals for the Army Air Forces.

Dr. P. T. McClelland was recently appointed Health Officer of Vero Beach.

Dr. W. W. Rogers was recently appointed Health Officer of Jacksonville to succeed Dr. N. A. Upchurch, who retired. Dr. Rogers has been connected with the Health Department of Jacksonville for the past fourteen years.

Florida physicians have been organized into five base hospital units for wartime protection of the civilian population. Dr. Gilbert S. Osincup, Orlando, is Chairman of the Health and Housing Division of the State Defense Council. Each unit is composed of fifteen physicians who will be based at Pensacola, Jacksonville, Orlando, Miami and Tampa, the five units a part of a total of 24 in six southeastern states. Members will be given commissions, inactive status, in the U. S. Public Health Service Reserve and will be called to active duty in case of grave emergency.

Dr. C. A. Rudisill, Lieutenant Commander, U. S. Navy, formerly of Tampa, recently received the Naval Reserve medal for efficient and faithful service at the Naval Hospital in Jacksonville.

Dr. William R. Wandeck, Marianna, and Miss Virginia Kirkland, Metta, Georgia, were married recently.

Dr. James L. Estes and Miss Mays Sanford, both of Tampa, were married recently.

Dr. William H. Walters, Jr., Lacooche, and Miss Helen Hancock were married recently.

Deaths

Dr. William P. Adamson, Tampa, aged 69, died January 3.

Dr. Daniel Newman Cone, White Springs, aged 67, died recently of lymphosarcomatosis.

Dr. Alva Curtis Hamblin, Valrico, aged 83, died recently of chronic prostatic hypertrophy and uremia.

Dr. Amon S. Hill, Panama City, aged 81, died recently of nephritis.

Dr. Thomas McLeod, Webster, aged 78, died recently.

Dr. George Harvey Parmenter, St. Petersburg, aged 66, died recently of arteriosclerosis and myocardial failure.

Dr. David Rose, Sebastian, aged 88, died recently.

Dr. William J. Williams, Cassia, aged 64, died recently.

GEORGIA

Medical Association of Georgia will hold its ninety-fourth annual meeting at the Biltmore Hotel, Atlanta, May 11-14.

Bibb County Medical Society has elected Dr. Alvin E. Siegel, President; Dr. A. M. Phillips, President-Elect; and Dr. R. W. McAllister, Secretary-Treasurer, all of Macon.

Carroll County Medical Society has elected Dr. S. F. Scales, Carrollton, President; Dr. J. E. Powell, Villa Rica, Vice-President; and Dr. D. S. Reese, Carrollton, Secretary-Treasurer.

Cherokee-Pickens Counties Medical Society has elected Dr. Jno. T. Pettit, President; and Dr. R. T. Jones, Secretary-Treasurer, both of Canton.

Coweta County Medical Society has elected Dr. W. H. Tanner, President; and Dr. M. F. Cochran, Secretary-Treasurer, both of Newnan.

Emanuel County Medical Society has elected Dr. J. H. Chandler, President; Dr. S. S. Youmans, Vice-President; and Dr. D. D. Smith, Secretary-Treasurer, all of Swainsboro.

Floyd County Medical Society has elected Dr. A. F. Routledge, President; Dr. Warren M. Gilbert, Honorary President; Dr. Robert Harbin, Jr., Vice-President; and Dr. Inman Smith, Secretary-Treasurer, all of Rome.

Fulton County Medical Society has installed Dr. George W. Fuller, President; and elected Dr. Ben H. Clifton, President-Elect; Dr. McClaren Johnson, Vice-President; and Dr. Eustace A. Allen, Secretary-Treasurer, all of Atlanta.

Georgia Medical Society has installed Dr. J. Reid Broderick, President; and elected Dr. E. J. Whelan, President-Elect; and Dr. S. Elliott Wilson, Secretary-Treasurer, all of Savannah.

Habersham County Medical Society has elected Dr. Fred Crenshaw, Also, President; Dr. J. B. Jackson, Clarkesville, Vice-President; and Dr. T. H. Brabson, Cornelia, Secretary-Treasurer.

Jenkins County Medical Society has elected Dr. H. H. Lee, President; and Dr. A. P. Mulkey, Millen, Vice-President.

Meriwether County Medical Society has elected Dr. Chas. E. Irwin, Warm Springs, President; Dr. Stuart Raper, Warm Springs, Vice President; and Dr. R. B. Gilbert, Greenville, Secretary-Treasurer.

Spalding County Medical Society has elected Dr. W. C. Miles, President; Dr. T. I. Hawkins, Vice-President; and Dr. T. O. Vinson, Secretary-Treasurer, all of Griffin.

Troup County Medical Society has elected Dr. Hugh McCulloh, Jr., President; Dr. C. O. Williams, Vice-President; and Dr. J. C. Morgan, Secretary-Treasurer, all of West Point.

Warren County Medical Society has elected Dr. H. B. Cason, President; Dr. F. L. Ware, Vice-President; and Dr. A. W. Davis, Secretary-Treasurer, all of Warrenton.

Ware County Medical Society has elected Dr. W. M. Flanagin, President; Dr. J. E. Penland, Vice-President; and Dr. Kenneth McCullough, Secretary-Treasurer, all of Waycross.

St. Joseph's Hospital, Savannah, has elected Dr. William B. Crawford, President; and Dr. E. N. Gleaton, Vice-President.

Baldwin County Medical Society recently passed a motion to establish health centers at Stevens' Pottery and Milledgeville in cooperation with the physicians at the Milledgeville State Hospital.

Dr. Joseph Yampolsky and Dr. Charles C. Powell, Atlanta, were presented on January 4 with the L. C. Fischer award of $100 for the best written paper given before the Fulton County Medical Society during the past year, the title of the paper "Syphilitic Aortitis in a Nine Year Old Child." A similar prize for the best research work went to Dr. John Ross McCain, Atlanta, for his paper on "Acute Pancreatitis."

Dr. Wm. F. Lake announces the removal of his office to the Crawford W. Long Memorial Hospital, Atlanta, with practice limited to roentgenology.

Dr. A. J. Ayers, Atlanta, announces that he will continue laboratory, x-ray and clinical pathologic practice at Suite 111, Medical Arts Building.

Dr. Arthur J. Merrill, Atlanta, who has taken special work in clinical aspects of tropical medicine at the Army Medical College, Washington, D. C., and Dr. William Platt, Atlanta, who has studied the laboratory aspects of tropical diseases at New Orleans, Louisiana, have arranged introduction of courses in tropical diseases at Emory University School of Medicine, Dr. Merrill Instructor in Medicine and Dr. Platt Instructor in Pathology.

Deaths

Dr. Cluese A. Blanchard, Augusta, aged 72, died recently.

Dr. James R. Boring, Canton, aged 64, died recently.

Dr. Hinton Miller Belflower, Sycamore, aged 65, died recently of heart disease.

Dr. Booton Stover Compton, Atlanta, aged 59, died recently of a fracture received in a fall in his home.

Dr. Madison Pope Deadwyler, Maysville, aged 69, died recently.

Dr. John H. Horne, Robesonia, aged 77, died recently.

Dr. James E. New, aged 65, died recently of pneumonia.

Dr. John W. Pinkston, Greenville, aged 82, died recently.

Dr. James Thweatt Ross, Macon, aged 82, died recently.

Dr. Thomas Pinckney Waring, Savannah, aged 76, died January 8.

Dr. Cadow B. Walling, Collins, aged 72, died recently.

KENTUCKY

Boyd County Medical Society has elected Dr. H. R. Skaggs, Ashland, President; Dr. M. C. Prichard, Catlettsburg, Vice-President; Dr. R. G. Culley, Ashland, Secretary; and Dr. C. K. Kercheval, Ashland, Treasurer.

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Dermatitis
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[1] Spies, T. D., Cooper, C.: Int. Clinics, Vol. IV, Series 47, 1937
[2] Morgan, A. F.; Science, March 14, 1941

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Campbell-Kenton County Medical Society has elected Dr. N. A. Jett, Covington, President; Dr. Oscar Frickman, Newport, Vice-President; Dr. Jos. Northcutt, Covington, Treasurer; and Dr. Robert L. Blitz, Secretary.

Graves County Medical Society has elected Dr. J. H. Shelton, President; Dr. N. M. Atkins, Vice-President; and Dr. H. H. Hunt, Secretary-Treasurer, all of Mayfield.

Harrison County Medical Society has elected Dr. C. L. Swinford, President; Dr. H. C. Blount, Vice-President; and Dr. W. B. Moore, Secretary-Treasurer, all of Cynthiana.

Letcher County Medical Society has elected Dr. R. Dow Collins, Whitesburg, President; Dr. E. C. Schofield, Fleming, Vice-President; and Dr. Bert C. Bach, Whitesburg, Secretary-Treasurer.

Madison County Medical Society has elected Dr. John Baker, Berea, President; Dr. Scott T. McGuire, Berea, Vice-President; and Dr. Max Blue, Richmond, Secretary-Treasurer.

Rockcastle County Medical Society has elected Dr. Lee Chesnut, Mount Vernon, President; Dr. Walker Owens, Mount Vernon, Vice-President; and Dr. Robert G. Webb, Livingston, Secretary.

Dr. Udo J. Wile, Medical Director, U. S. Public Health Service, was recently in Kentucky for a short period as Advisory Consultant to the medical profession in the clinical management of syphilis.

DEATHS

Dr. Charles Blanchard Bard, Water Valley, aged 54, died recently of coronary heart disease.

Dr. Thomas Monroe Garner, Somerset, aged 59, died recently of organic valvular disease of the heart.

Dr. Richard H. Greenwell, Bardstown, aged 64, died recently.

Dr. James Daniel Renick, Smiths Grove, aged 86, died recently.

Dr. Martin Sauter, Newport, aged 51, died January 2.

Dr. Arthur Ellis Threlkeld, Wheatley, aged 80, died recently of coronary sclerosis.

Dr. Harry W. Watts, Pembroke, aged 70, died recently of bulbar paralysis and pneumonia.

Dr. John W. Wells, Magnolia, aged 72, died recently.

LOUISIANA

Louisiana State Medical Society's Executive Committee has decided to dispense with the scientific program and entertainment features of the annual meeting and have only a business meeting at Baton Rouge, May 3. On the evening of May 3 the Presidential Address, the Annual Oration and the presentation of medal to the Retiring President will be held. Plans and other details are being arranged by the East Baton Rouge Parish Medical Society in co-operation with the Executive Officers. While it is a business meeting the Executive Officers would be glad for all those who can to attend.

Ouachita Parish Medical Society has elected Dr. Glenn T. Gallaspy, West Monroe, President; Dr. W. E. Jones, Monroe, Vice-President; and Dr. G. A. Varino, Monroe, Secretary-Treasurer.

Southern Baptist Hospital, New Orleans, has elected the following officers: Dr. P. H. Jones, Chairman; Dr. R. F. Sharp, Vice-Chairman; Dr. Joseph W. Reddoch, Secretary; and Dr. Joseph H. Wells, Treasurer.

Dr. Virginia E. Webb, former Chief, Division of Maternal and Child Welfare of the State Department of Health, has resigned and moved to Mobile, Alabama, to enter private practice.

Dr. Rudolph Matas, New Orleans, was recently presented with the medal of the Nu Sigma Nu Degree of Merit, which award is the highest honor conferred by Nu Sigma Nu, in culmination of approximately thirty years of service which Dr. Matas has rendered the fraternity as a faculty member of Beta Iota Chapter of the Tulane Medical School, including President of the National Honorary Council in 1935.

DEATHS

Dr. Charles Judson Gordon, Sicily Island, aged 69, died recently of heart disease.

MARYLAND

Medical and Chirurgical Faculty of Maryland will hold its next annual meeting at Baltimore, April 27-28.

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Radiography *in Pregnancy*

THERE is a justifiable application of radiography in every pregnancy. Whether the anatomic conditions are normal or abnormal, close co-operation between the attending physician and a radiologist tends to simplify the problems of childbirth, and to reduce both maternal and infant mortality. Eastman Kodak Company, Rochester, N. Y.

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Continued from page 40

Allegany-Garrett County Medical Society has elected Dr. H. W. Eliason, President; Dr. C. C. Simmerman, Vice-President; Dr. S. M. Jacobson, Secretary; and Dr. Clay Durrett, Treasurer, all of Cumberland.

Calvert County Medical Society has elected Dr. H. W. Ward, Owings, President; Dr. P. C. Jett, Prince Frederick, Vice-President; and Dr. Everard Briscoe, Prince Frederick, Secretary.

An army industrial hygiene laboratory has been established at the Johns Hopkins University School of Hygiene and Public Health, Baltimore, which will operate under the direction of the occupational hygiene branch of the preventive medicine division of the Office of the Surgeon General of the Army.

Johns Hopkins University School of Hygiene and Public Health, Baltimore, has received a grant of $59,244 (the term of the grant being five years and the total approved for that period $300,000) from the National Foundation of Infantile Paralysis.

Dr. Paul J. Isen, Fort Howard, and Miss Regina Nelson, New York City, were married recently.

Dr. John William Spies, Baltimore, and Miss Margaret Pense Sheffield, Alvin, Texas, were married February 13.

Deaths

Dr. Albert Allemann, Takoma Park, aged 82, died recently.

Dr. Robert Anderson Bennett, Riverdale, aged 80, died recently.

Dr. Robert S. Kirk, Baltimore, aged 71, died recently of pneumonia.

Dr. Elmer Burkitt Freeman, Baltimore, aged 67, died recently of myocardial infarction with cerebral embolus.

Dr. Samuel Stockton Miles, Baltimore, aged 28, commissioned a lieutenant (JG) in the Medical Corps, U. S. Naval Reserve, in May, 1942, attached to the Marine Corps, was killed in action on the Florida Island in the Solomons, August 7, 1942.

Dr. Robert L. Mitchell, Baltimore, aged 61, died recently of coronary thrombosis.

Dr. John Rathbone Oliver, Baltimore, aged 71, died recently of bronchopneumonia.

Dr. Joseph H. Spicer, Cumberland, aged 56, died recently of chronic myocarditis.

Dr. Howard Thomas Robinson, Cumberland, aged 62, died recently of coronary occlusion.

Dr. Leo Zon, Baltimore, aged 36, died recently of meningococcic septicemia and cerebrospinal meningitis.

MISSISSIPPI

Mississippi State Medical Association will hold its next annual meeting at Jackson, May 11-13.

State Board of Health held its regular semi-annual meeting recently and the members comprising the Board are: Dr. J. W. Lipscomb, Columbus, President; Dr. S. E. Eason, New Albany; Dr. L. B. Austin, Rosedale; Dr. B. J. Shaw, Slate Springs; Dr. W. H. Banks, Philadelphia; Dr. J. P. Culpepper, Hattiesburg; Dr. S. E. Field, Centreville; Dr. L. W. Long, Jackson; Dr. Wm. R. Wright, Jackson; and Dr. Felix J. Underwood, Jackson, Executive Officer and Secretary.

Dr. Emma Gay, Biloxi, head of the Mississippi Division of the Women's Field Army, has completed a course at the Field Army Officers' Training School.

Deaths

Dr. James C. Rush, Waynesboro, aged 75, died recently of sarcoma of the prostate and angina pectoris.

Dr. Robert Mills Stephenson, Lexington, aged 59, died recently of coronary thrombosis.

Dr. Hal Shackelford Tucker, Laurel, aged 88, died recently.

MISSOURI

Missouri State Medical Association will hold its next annual meeting at St. Louis, April 18-20.

Audrain County Medical Society has elected Dr. Harry F. O'Brien, Mexico, President; Dr. W. W. Bland, Vandalia, Vice-President; and Dr. R. S. Williams, Mexico, Secretary.

Buchanan County Medical Society has installed Dr. A. R. Timerman, President; and elected Dr. L. C. Bauman, Vice-President; Dr. Claude S. Grant, Vice-President; Dr. O. E

Continued on page 44

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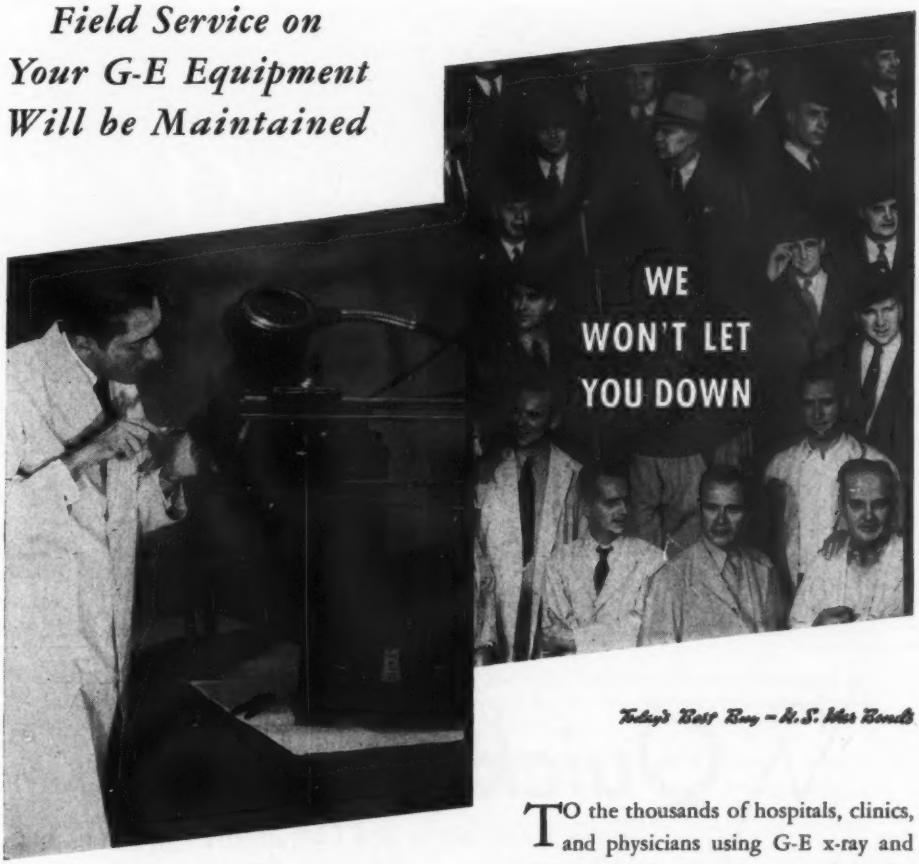


Today's Best Buy – U. S. War Bonds

TO the thousands of hospitals, clinics, and physicians using G-E x-ray and electromedical apparatus, we address this message of assurance: *G. E.'s local branch offices throughout the United States and Canada, which for years past have responded to your various needs, will continue to provide that expert maintenance service so important in today's handling of the health problem.* ¶ Since you probably are working your equipment harder these days than ever before, it is highly important that it be kept working, and we are not unmindful of the responsibility which we assumed when you bought G-E equipment—to help you maintain it in the best possible operating condition. ¶ We give you this assurance despite the difficulties under which our field representatives are working, due to tire and gas rationing and other war-time restrictions. Because these men are determined to justify your manifested confidence in the G-E organization, you'll find them ready and willing to sacrifice even their own time when you are urgently in need of maintenance service. *They won't let you down!*

GENERAL ELECTRIC X-RAY CORPORATION

2012 JACKSON BLVD. CHICAGO, ILL., U. S. A.

Continued from page 42

Whitsell, Secretary, re-elected; and Dr. J. M. Bell, Treasurer, re-elected, all of St. Joseph.

Callaway County Medical Society has elected Dr. C. C. Ault, President; Dr. Henry Durst, Vice-President and Treasurer; and Dr. R. N. Crews, Secretary, all of Fulton.

Cass County Medical Society has elected Dr. L. V. Murray, Pleasant Hill, President; Dr. E. A. Albers, Pleasant Hill, Vice-President; and Dr. David S. Long, Harrisonville, Secretary-Treasurer.

Greene County Medical Society has elected Dr. C. Souter Smith, President; Dr. L. F. Heimburger, Vice-President; Dr. J. M. Sartin, Treasurer; and Dr. A. Denton Vail, Secretary, all of Springfield.

Grundy-Daviess County Medical Society has elected Dr. Bertha D. S. Sheetz, President; Dr. E. C. Ambrose, Vice-President; and Dr. E. A. Duffy, Secretary-Treasurer, all of Trenton.

Howard County Medical Society has elected Dr. J. W. Gardner Glasgow, President; and Dr. M. P. Leech, Fayette, Secretary.

North Central Counties Medical Society has elected Dr. A. B. Cramb, Kirksville, President; Dr. H. M. Humphrey, Brashear, Dr. F. E. Lumen, Edina, Dr. Ida M. Nulton, Lancaster, Dr. P. V. Hart, Coatsville, and Dr. J. S. Montgomery, Milan, Vice-Presidents; and Dr. A. F. Miller, Kirksville, Secretary-Treasurer.

Randolph-Monroe County Medical Society has elected Dr. F. A. Barnett, Paris, President; Dr. R. H. Williams, Moberly, Vice-President; and Dr. F. L. McCormick, Moberly, Secretary-Treasurer.

Ste. Genevieve County Medical Society has elected Dr. A. E. Sexauer, President; Dr. C. J. Clapsaddle, Vice-President; and Dr. Robert W. Lanning, Secretary-Treasurer, all of Ste. Genevieve.

St. Louis Medical Society announces the gift of a collection on ophthalmology from Dr. Joseph W. Charles, St. Louis.

A memorial plaque was presented recently to the St. Louis Medical Society by friends of the late Dr. William T. Coughlin.

Missouri Methodist Hospital, St. Joseph, has re-elected Dr. William J. Hunt, President of the Staff and elected Dr. S. E. Senor, Vice-President; Dr. Clifton Smith, Secretary-Treasurer; and Dr. Paul Forgrave, Dr. E. M. Shores and Dr. E. A. Miller, the Executive Committee.

Freeman Hospital, Joplin, has elected Dr. C. W. Poor, President of the staff; Dr. Frances E. Rosenthal, Secretary-Treasurer; Dr. O. T. Blanke, Chairman, Efficiency Committee; Dr. Charles T. Reid, Chairman, Staff Committee; Dr. Roy E. Myers, Chairman, Records Committee; and Dr. Richard C. Newkirk, Chairman, Program Committee.

Dr. J. Lee Harwell, Poplar Bluff, was recently appointed to the City Board of Health. Dr. A. R. Rowe and Dr. W. L. Brandon, both of Poplar Bluff, are the other members of the Board.

Dr. Grace S. Mountjoy, St. Louis, will represent the St. Louis Medical Society as a delegate at the 1943 Annual Session, the first woman delegate the St. Louis Medical Society has had.

Dr. Edward A. Doisy (Ph.D.), Professor and Director of the Department of Biochemistry, St. Louis University School of Medicine, St. Louis, was presented with the annual award of distinction of the American Pharmaceutical Manufacturers' Association at its recent annual meeting in New York, "in recognition of Dr. Doisy's isolation in pure form of the female sex hormone estrone (theelin) and his other valuable contributions to knowledge of estrogenic substances important in therapy and research."

Deaths

Dr. Gordian Edward Benes, St. Louis, aged 57, died recently of brain tumor.

Dr. Alan Duncan Calhoun, Richmond Heights, aged 35, died recently of subarachnoid hemorrhage and rupture of a cerebral aneurysm.

Dr. Royal L. Garner, Milan, aged 81, died January 4.

Dr. Clark S. Glover, Russellville, aged 68, died January 5.

Dr. Oscar Blin Hall, Warrensburg, aged 74, died recently.

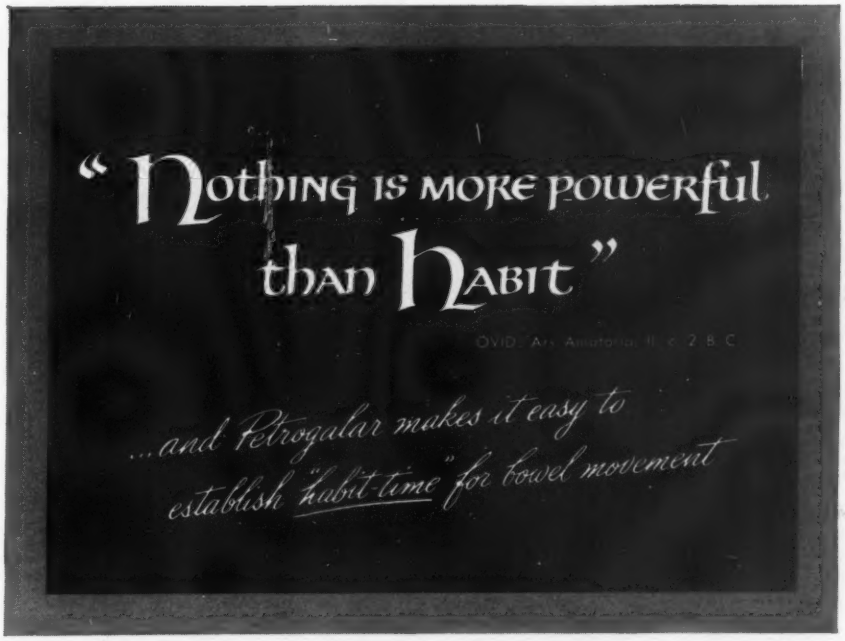
Dr. Orlando S. Harmon, DeKalb, aged 78, died recently.

Dr. William A. Hoelscher, St. Louis, aged 77, died recently.

Dr. Herbert Edward Markwort, aged 65, died recently of heart disease.

Continued on page 46

for Quick Action!
in the Respiratory and Circulatory Emergencies of Intravenous Barbiturate Anesthesia
inject Metrazol
COUNCIL ACCEPTED
1 to 3 cc. and repeat intravenously, intramuscularly, subcutaneously
Ampules 1 and 3 cc., tablets, solution, powder
collapse following accidents or surgical trauma · opiate and barbiturate depression · asphyxia · denarcotization after general anesthesia · circulatory and respiratory support in the emergencies of pneumonia . . . . . .
Metrazol, brand of pentamethylentetrazol, Trade Mark, reg. U. S. Pat. Off.
BILHUBER-KNOLL CORP. - - ORANGE, NEW JERSEY


"Nothing is more powerful than Habit"
OVID: Ars Amatoria, II, c. 2 B.C.
...and Petrogalar makes it easy to establish "habit time" for bowel movement

Half the job in treating constipation is getting the patient to establish "Habit Time" of bowel movement. The other half is to maintain it.

Petrogalar is a useful aid in doing both.

An *aqueous* suspension of mineral oil, Petrogalar adds unabsorbable fluid in the colon. Brings about comfortable elimination with no straining . . . no discomfort.

Unlike plain mineral oil, Petrogalar supplies moisture . . . retains moisture . . . counteracts excessive dehydration.

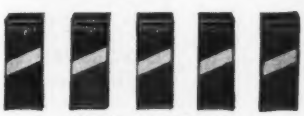
Miscibility and even dissemination are assured by the fine division of suspended oil globules.

Petrogalar is pleasant to take. It may be thinned with water, milk or fruit juices.

Five types offer latitude of choice in treating a wide range of conditions.

Try Petrogalar on your next group of patients.

*Reg. U. S. Pat. Off. Petrogalar is an aqueous suspension of pure mineral oil. Each 100 cc. of which contains 65 cc. pure mineral oil suspended in a flavored aqueous gel.



Supplied in 5 Types

Petrogalar Laboratories, Inc.
Chicago, Illinois

Petrogalar

Promotes "Habit-Time" Bowel Movements

Continued from page 44

NORTH CAROLINA

Medical Society of the State of North Carolina will hold its next annual meeting at Raleigh, May 10-12.

Buncombe County Medical Society has decided to discontinue publication of its monthly bulletin and to hold only one meeting a month for the duration of the war.

Alamance-Caswell Medical Society has elected Dr. J. B. Walker, Burlington, President; Dr. J. L. Johnson, Graham, Vice-President; and Dr. P. Y. Greene, Graham, Secretary-Treasurer.

Catawba Valley Medical Society has elected Dr. Clyde R. Hedrick, Lenoir, President; Dr. W. L. Oehlbeck, Morganton, Vice-President; and Dr. L. A. Crowell, Jr., Lincolnton, Secretary-Treasurer, re-elected.

Forsyth County Medical Society has elected Dr. W. L. Kirby, President; Dr. E. S. Thompson, First Vice-President; Dr. C. H. McCants, Second Vice-President; Dr. Howard Starling, Treasurer; and Dr. Carlon N. Adams, Secretary, all of Winston-Salem.

Mecklenburg County Medical Society has elected Dr. T. C. Bost, President; Dr. Luther W. Kelly and Dr. Ernest W. Franklin, Vice-Presidents; and Dr. M. T. Gilmour, Secretary-Treasurer, all of Charlotte.

North Carolina Academy of Public Health was recently organized and officers elected are: Dr. George M. Cooper, Raleigh, President; Dr. Ernest A. Branch, Director, Division of Oral Hygiene, Vice-President; and Mrs. Anne B. Edward, Secretary to the State Health Officer, Secretary-Treasurer.

A grant of $1,610 under the Blood and Plasma Bank Program has been approved for aid in establishing a Blood and Plasma Bank at the North Carolina Baptist Hospital, Winston-Salem. All students of the Bowman Gray School of Medicine of Wake Forest voted to give up to two pints of blood for a reserve of 300 pints in the Blood Bank to be used in war emergencies.

Dr. Harold Clark, Asheville, President-Elect of the Buncombe County Medical Society, has reported for active duty in the Army Medical Corps.

Dr. Alexander Webb, Jr., Raleigh, was recently presented a gold key by the Junior Chamber of Commerce for his selection as "Raleigh's outstanding young citizen of 1942."

Dr. Irvin Thomas Blanchard, Woodland, and Miss Lois Jean Bateman, Tarboro, were married recently.

Dr. Beaty Lee Bass, Lenoir, and Miss Patsy Smith, Winston-Salem, were married recently.

Dr. Hubert Benbury Haywood, Jr., Raleigh, and Miss Virginia Louise Allison, Richmond, Virginia, were married recently.

Dr. Claude Nash Herndon, Jr., Winston-Salem, and Miss Margaret Forester Caldwell, Greensboro, were married recently.

Dr. Lawrence E. Metcalf, Asheville, and Miss Margaret John Holland were married recently.

Dr. Henry William Scott, Jr., Graham, and Miss Mary Louisa Vanamee, Cape Elizabeth, Maine, were married recently.

Dr. William A. Van Nortwick, Greenville, and Miss Grace C. Taylor, Morehead City, were married recently.

Deaths

Dr. Louis Fuldner, Tryon, aged 69, died recently.

Dr. Joseph W. Halford, Raleigh, aged 72, died recently of burns received when he fell asleep while smoking.

Dr. James Manney Howard, Jr., Kinston, aged 51, died recently.

Dr. Walter E. Storm, Wilmington, aged 87, died recently.

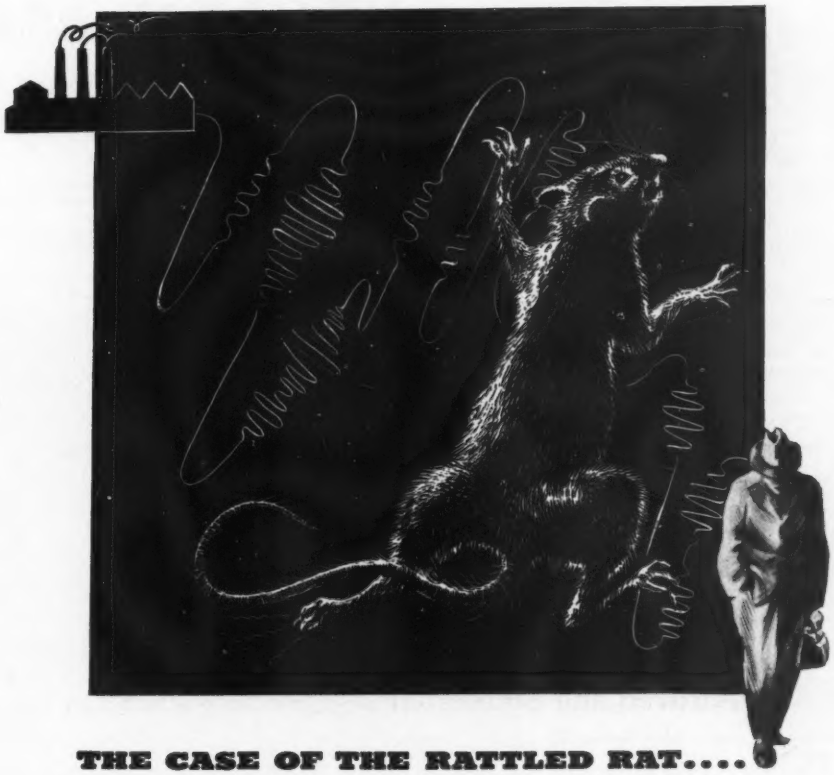
OKLAHOMA

Blaine County Medical Society has elected Dr. Virginia Olson Curtin, Watonga, President; Dr. Frank Buchanan, Canton, Vice-President; and Dr. W. F. Griffin, Watonga, Secretary-Treasurer.

Bryan County Medical Society has elected Dr. J. T. Colwick, President; Dr. J. T. Wharton, Vice-President; and Dr. W. K. Haynie, Secretary-Treasurer, all of Durant.

Craig County Medical Society has elected Dr. Felix M. Adams, President; Dr. Lloyd H. McPike, Vice-President; and Dr. J. M. McMillan, Secretary-Treasurer, re-elected, all of Vinita.

Continued on page 48



THE CASE OF THE RATTLED RAT....

• Recent experiments[1] have shown that convulsive seizures frequently occur in rats following brief exposure to a high-pitched note, and such reactions can be greatly reduced by the administration of Vitamin B-complex.

The implications of these findings are of clinical interest. It has not yet been determined whether individuals exposed to noise require more than ordinary amounts of the Vitamin B-complex, but it *is* known that men maintained on vitamin-deficient diets become easily fatigued and suffer from lassitude and loss of interest in work.[2] Moreover, deficiencies of the Vitamin B-complex constitute the most serious aspect of current, widespread malnutrition.

Since food habits are difficult to change, the supplementary administration of essential B vitamins appears to offer the most practical course in prophylaxis or treatment of Vitamin B-complex deficiency . . . *Elixir 'B-G-Phos' is designed for this purpose and provides all the essential elements of the Vitamin B-complex with glycerophosphates as well.* Sharp & Dohme, Philadelphia, Pa.

1. J. Comparative Psychology, 31:1, 1941
2. American J. Public Health, 32:523, May, 1942

ELIXIR 'B-G-PHOS'

Continued from page 46

Carter County Medical Society has elected Dr. Walter Hardy, Ardmore, President; Dr. D. E. Cantrell, Sr., Heraldton, Vice-President; Dr. H. A. Higgins, Ardmore, Secretary-Treasurer.

Custer County Medical Society has elected Dr. F. R. Vieregg, President; Dr. Ross Deputy, Vice-President; and Dr. C. J. Alexander, Secretary-Treasurer, all of Clinton.

Harmon County Medical Society has elected Dr. W. G. Husband, President; Dr. R. H. Lynch, Vice-President; and Dr. L. E. Hollis, Secretary-Treasurer, all of Hollis.

Jefferson County Medical Society has elected Dr. F. M. Edwards, Ringling, President; Dr. C. M. Maupin, Waurika, Vice-President; and Dr. L. L. Wade, Ryan, Secretary-Treasurer.

Kay County Medical Society has elected Dr. Philip C. Risser, Blackwell, President; Dr. G. H. Yeary, Newkirk, Vice-President; and Dr. J. Holland Howe, Ponca City, Secretary-Treasurer, re-elected.

Logan County Medical Society has elected Dr. William C. Miller, Guthrie, President, re-elected; Dr. Charles L. Rogers, Marshall, Vice-President; and Dr. J. L. LeHew, Jr., Guthrie, Secretary-Treasurer.

Okmulgee County Medical Society has elected Dr. A. R. Holmes, Henryetta, President; Dr. H. D. Boswell, Henryetta, Vice-President; and Dr. J. C. Matheney, Okmulgee, Secretary-Treasurer.

Pottawatomie County Medical Society has elected Dr. A. C. McFarling, President; Dr. Charles W. Haygood, Vice-President; and Dr. Clinton Gallaher, Secretary-Treasurer, re-elected, all of Shawnee.

Pushmataha County Medical Society has elected Dr. John S. Lawson, Clayton, President; and Dr. B. M. Huckabay, Antlers, Secretary-Treasurer.

Tulsa County Medical Society has installed Dr. James C. Peden, President; and elected Dr. R. A. McGill, President-Elect; Dr. H. A. Ruprecht, Vice-President; and Dr. E. O. Johnson, Secretary-Treasurer, re-elected, all of Tulsa.

Woods County Medical Society has elected Dr. C. A. Traverse, President; Dr. D. B. Ensor, Hopeton, Vice-President; and Dr. O. E. Templin, Alva, Secretary-Treasurer.

Woodward County Medical Society has elected Dr. C. E. Williams, President; Dr. D. W. Darwin, Vice-President; and Dr. C. W. Tedrowe, all of Woodward, Secretary-Treasurer.

Deaths

Dr. John Elwood Cullum, Tulsa, aged 83, died recently of pneumonia and senility.

Dr. James William Powell, Kansas, aged 69, died recently.

SOUTH CAROLINA

Chester County Medical Society has elected Dr. E. D. Wells, President; Dr. J. N. Gaston, Vice-President; and Dr. R. D. Hicks, Secretary-Treasurer, all of Chester.

Chesterfield County Medical Society has elected Dr. D. C. Griggs, Pageland, President; and Dr. William Perry, Chesterfield, Secretary-Treasurer.

Medical Society of South Carolina has elected Dr. John F. Townsend, President; Dr. Paul W. Sanders, Vice-President; Dr. Robert Wilson, Jr., Secretary-Treasurer; and Dr. W. C. O'Driscoll, Librarian, all of Charleston.

Dr. John Corbett, Camden, was recently re-elected President of the Board of Directors of the Camden Hospital.

Dr. M. L. Mathias, Columbia, recently took a course in urology at the Cook County Hospital in Chicago.

Dr. Richard B. Josey, Lieutenant Colonel, Medical Corps, U. S. Army, formerly of Columbia, is one of the officers of O'Reilly Hospital, Springfield, Missouri.

Dr. James C. Brabham, Union, has been honorably discharged from the Army and is now with the State Board of Health.

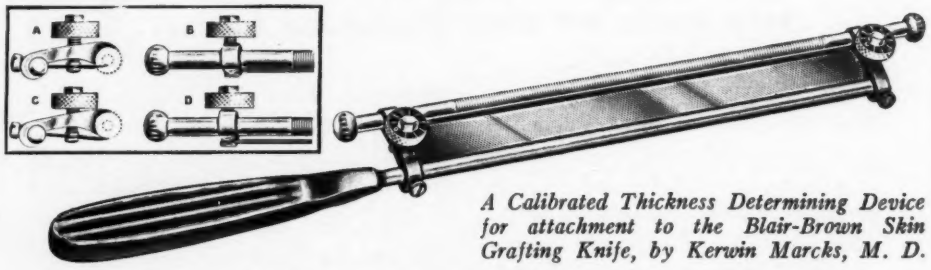
Dr. G. S. Rhame, Camden, is Secretary of the Kershaw County Medical Society in the absence of Dr. F. G. Shaw, Camden, who recently reported to the armed forces.

Dr. Mordecai Nachman, Greenville, has been made a Fellow of the American College of Surgeons.

Dr. Abram Berry, Columbia, and Miss Bernice Frances Coleman, Charleston, were married recently.

Continued on page 50

For An Improved and Simplified Technic in Split Skin Grafts



A Calibrated Thickness Determining Device for attachment to the Blair-Brown Skin Grafting Knife, by Kerwin Marcks, M. D.

This attachment for the widely used Blair-Brown skin knife provides the operator with a simplified means of cutting uniform and accurate thicknesses of split skin grafts.

In use, the thickness of the desired skin graft may be set before the operation and can be changed at will during the operation by simply readjusting the knurled and calibrated screws. The threaded rod grips the skin and its extra length over the distance between the clamps allows the knife to be worked to and fro.

Illustrations "A-B" and "C-D" above show how the set screws regulate the distance between the cutting edge of the knife and the threaded grip rod. The large illustration shows the attachment mounted on the knife ready for use.

A-B967 — Blair - Brown Skin Grafting Knife complete with the Marcks Thickness Determining Attachment $18.50

A. S. ALOE COMPANY, 1831 Olive St., St. Louis, Mo.

BACK HOME AT 4 . . .
AND WITH AN APPETITE

For the normal as well as the undernourished child, a tasty between-meals' snack of Horlick's Fortified offers an excellent tide-over to the next full meal.

Instead of loading up with appetite - destroying confections or sweet drinks of poor food quality, why not let them benefit from the basic, nutritive and protective elements found in Horlick's.

HORLICK'S FORTIFIED

Horlick's Fortified provides rich protein, carbohydrate and fat in balanced proportions, calcium and other essential minerals, together with maintenance doses of A, B_1, D and G.

Moreover, Horlick's is partially predigested, homogenized, has negligible curd tension and, therefore, leaves the stomach rapidly enough to avoid destroying appetite for the next full meal.

Recommend
HORLICK'S

The *Complete* Malted Milk—Not Just a Malt Flavoring for Milk.

HORLICK'S

Continued from page 48

Dr. Jennings Kerr Owens, Bennettsville, and Miss Grace S. Buie, Denmark, were married recently.

Dr. Hubert Claytor, Jr., Hopkins, and Miss Florence Rivers Armour were married recently.

Deaths

Dr. Henry M. Rutledge, Laurens, aged 33, died January 18.

TENNESSEE

Tennessee State Medical Association, House of Delegates only, will meet at the Hotel Noel, Nashville, April 11.

Giles County Medical Society has elected Dr. L. A. Edmundson, Bethel, President; Dr. D. W. Cowgill, Pulaski, Vice-President; and Dr. W. K. Owens, Pulaski, Secretary.

Greene County Medical Society has elected Dr. L. E. Coolidge, Greenville, President; Dr. W. T. Mathes, Greenville, Vice-President; and Dr. J. E. Kite, Jr., Bullsgap, Secretary.

Haywood County Medical Society has elected Dr. John C. Thornton, Brownsville, President; Dr. F. P. Hess, Bells, Vice-President; and Dr. Roy M. Lanier, Brownsville, Secretary.

McKinn County Medical Society has elected Dr. W. E. Foree, Athens, President; Dr. D. F. Seay, Englewood, Vice-President; and Dr. Roy W. Epperson, Athens, Secretary.

Monroe County Medical Society has elected Dr. H. C. Schearer, President; Dr. B. W. Bagwell, Vice-President; and Dr. R. C. Kimbrough, Secretary-Treasurer, all of Madisonville.

Memphis and Shelby County Medical Society has installed Dr. W. L. Rucks, President; and elected Dr. E. G. Kelly, President; Dr. B. F. Hardin, Vice-President; Dr. A. F. Cooper, Secretary; and Dr. C. F. Croswell, Treasurer, all of Memphis.

Polk County Medical Society has elected Dr. H. P. Hyde, Copperhill, President; Dr. C. W. Strauss, Copperhill, Vice-President; and Dr. F. O. Geisler, Isabella, Secretary.

Smith County Medical Society has elected Dr. John L. Beasley, Pleasant Shade, President; Dr. Rhea E. Garrett, Dixon Springs, Vice-President; and Dr. Thayer S. Wilson, Gordonsville, Secretary.

Sullivan-Johnson Counties Medical Society has elected Dr. D. D. Vance, Bristol, President; Dr. C. F. N. Schram, Kingsport, Vice-President for Sullivan County; Dr. H. S. Smythe, Mountain City, Vice-President for Johnson County; and Dr. G. W. Leavell, Bristol, Secretary-Treasurer.

Washington, Carter, Unicoi Counties Medical Society has elected Dr. J. R. Moody, Erwin, President; Dr. U. G. Jones, Johnson City, Vice-President; Dr. W. G. Frost, Elizabethton, Vice-President; and Dr. Edmund A. Lodge, Johnson City, Secretary-Treasurer.

White County Medical Society has elected Dr. J. C. Blankenship, Sparta, President; Dr. A. A Bradley, Cookesville, Vice-President; and Dr. B. L. Upchurch, Sparta, Secretary.

Williamson County Medical Society has elected Dr. W. B. Farris, President; Dr. B. T. Nolen, Vice-President; and Dr. H. C. Stewart, Secretary-Treasurer, all of Franklin.

Dr. Peter John Flippin, Jr., and Miss Helen Marguerite Cruze, both of Knoxville, were married recently.

Deaths

Dr. George Bradford Curry, Bolivar, aged 66, died recently of intestinal obstruction.

Dr. Isaac H. Hornsby, Whiteville, aged 93, died recently of coronary occlusion.

Dr. Enos E. Kincheloe, Church Hill, aged 79, died recently.

Dr. William P. Watson, Dyersburg, aged 68, died recently of carcinoma of the sigmoid with metastasis.

Dr. Whitman Rowland, Jr., Memphis, aged 50, died January 10.

TEXAS

State Medical Association of Texas, House of Delegates only, will meet at Fort Worth, May 3-6.

Bell County Medical Society has elected Dr. C. A. Stevenson, President; Dr. A. E. Wiedeman, Vice-President; and Dr. H. B. Anderson, Secretary-Treasurer, all of Temple.

Dallas County Medical Society has elected Dr. Davis Spangler,

Continued on page 52

Pepsencia
REG. U.S. PAT. OFF.
WITH VITAMIN B_1

The *old* and the *new* join therapeutic forces

PEPSENCIA, the original essence of pepsin which has served physicians continuously since 1879 in the treatment of gastric disorders, now joins therapeutic forces with the modern vitamin B_1.

To this combination PEPSENCIA brings the essential organic principles of the gastric juice with the entire soluble glandular constituents in their normal association. Vitamin B_1 is present in an amount of 1,000 I. U.—thiamine chloride 3 mgs.—to each fluid ounce or 125 to the teaspoonful.

PEPSENCIA with vitamin B_1 is highly agreeable to all conditions of appetite and age.

Originated and made by
FAIRCHILD BROS. & FOSTER
NEW YORK, N. Y.

DEATH RATE DECREASE: LIFE LINE INCREASE

The Pan American Clippers in the magazine, Time, give a statement from the late Dr. George Crile, skilled physician, sound philosopher and humanitarian, in part as follows:

> " 'What of the future?
>
> " 'The chief duty of the physician will be to develop the race to * * * direct the development of youth * * * and to guide the adult along sound biological lines so that he may safely engage in the maximum of work and play.
>
> " 'In other words, the physician will be called upon to study the whole problem of man in relation to his environment. As for disease, the physician will be more concerned with its prevention than with its treatment.' "

CHILD WELFARE

In the enforcement of a State's food and drug control law, one among us pioneered, with pediatricians and health officials, in cutting out one-half and more of the little white coffins going into the cemeteries. Clean milk, diphtheria control and other child health protection, going on in most cities during the last thirty or more years have saved enough unknown but living soldiers to make up a large part of the present American Army and Navy.

Where the mother has the constant aid of a doctor the death rate among babies is still lower.

PELLAGRA

Pellagra is being conquered; its death rate cut in two. Dried brewers' yeast with the whole treatments of the health official and neighborhood physician have been doing it.

We take some pride in having supplied the bulk of the dried brewers' yeast into the pellagra sections of the South; aiding in getting pellagrins to neighborhood physicians and in putting a large part of the treatment of this now diminishing disease onto a self-sustaining basis.

VITA-FOOD DRIED BREWERS' YEAST

There are two types of Vita-Food Dried Brewers' Yeast. The Green Label retains the hop flavor; the Red Label is debittered.

Quantity lots in 2, 50 or 100 pound canisters and the Red Label yeast in tablet form packed 4,000 to the container are specially priced to hospitals, medical clinics and for welfare use. Dried Brewers' Yeast is the standard source of the whole vitamin B: of the whole P-P factor.

Samples sent to physicians and hospitals.

VITAMIN FOOD COMPANY, INC.

VITAMIN RESEARCH LABORATORIES, INC.

122 Hudson Street **New York, N. Y.**

Continued from page 50

President; Dr. Fred T. Rogers, Vice-President; and Dr. W. W. Fowler, Secretary-Treasurer, re-elected, all of Dallas.

Denton County Medical Society has elected Dr. W. Louise Pierce, Aubrey, President; Dr. Amy S. Barton, Denton, Vice-President; Dr. Elizabeth A. Taylor, Denton, Secretary-Treasurer; and Dr. Eva E. Strahan, Denton, Censor, for a three-year term.

Henderson County Medical Society has elected Dr. A. C. Horton, Brownsboro, President, re-elected; Dr. L. L. Cockerell, Vice-President; and Dr. Don Price, Athens, Secretary-Treasurer, re-elected.

Navarro County Medical Society has elected Dr. Homer B. Jester, President; Dr. Will Miller, Vice-President; and Dr. J. Wilson Davis, Secretary, all of Corsicana.

Palo Pinto County Medical Society has elected Dr. A. J. Evans, President; Dr. E. F. Yeager, Vice-President; and Dr. J. E. Johnson, Secretary, all of Mineral Wells.

Tarrant County Medical Society has elected Dr. Frank G. Sanders, President; Dr. Rex Howard, Vice-President; and Dr X. R. Hyde, Secretary-Treasurer, re-elected, all of Fort Worth.

Mother Frances Hospital, Tyler, has elected to its staff: Dr. E. W. Clawater, President; Dr. C. E. Willingham, Vice-President; and Dr. W. M. Bailey, Secretary.

U. S. Army General Hospital, Temple, has been named in honor of Major James A. McCloskey, Medical Corps, the first regular army medical officer to lose his life in the present war with Japan during the battle of Bataan, Philippine Islands in March 1942. The McCloskey General Hospital has a capacity of 1,500 beds and a second unit is now under construction for an additional 1,500 beds. The following doctors serve as Chiefs of Service: Lieutenant Colonel Foy Roberson, Surgical; Major Sloan G. Stewart, Medical; Major David M. Earl, X-Ray; and Major Paul F. F. Schmitt, Laboratory.

Harmon General Hospital, Longview, was formally opened recently.

Dr. George W. Cox, Austin, Health Officer for the past six years, has been re-elected for a two-year term.

Dr. H. M. Sanford, Perryton, is in the Army Air Corps at San Antonio with the commission of First Lieutenant.

Dr. Gatlin Mitchell, Lieutenant Commander, Fort Worth, is at the U. S. Naval Base Hospital, San Diego, California.

Dr. Elizabeth Graham, Austin, was recently named Director of the Maternal and Child Health Division of the Austin City Health Department, succeeding Dr. W. W. Kelton, who entered the Army Air Corps.

Dr. Jane Byars, Fort Worth, was recently named Medical Advisor of the Texas League for Planned Parenthood.

Dr. Joe Shipman, Vernon, President, Wilbarger County Tuberculosis Association, recently donated a $500 war bond to that Association as the beginning of a fund for a tuberculosis sanatorium for Wilbarger County.

Dr. W. A. Lee and Dr. D. K. Jamison, Denison, were recently appointed Division Surgeon and Assistant Division Surgeon respectively of the M. K. & T. Employees Hospital Association.

A portrait of the late Dr. Meyer Bodansky was recently presented by the Alumni Association to the University of Texas Medical Branch, Galveston. Dr. Bodansky was associated with the University from 1919 until his death in 1941. At the time of his death he was also Director of the Laboratories of John Sealy Hospital.

Dr. John William Spies, Baltimore, Maryland, formerly of Galveston, and Miss Margaret Pense Sheffield, Alvin, were married February 13.

Dr. Ben A. Dreibrodt, San Antonio, and Miss Rita Leghart, Pittsburgh, Pennsylvania, were married recently.

Dr. Wendell Phillips Stampeli, Jr., Monahans, and Miss Carol Jean Wolkins, Charleston, South Carolina, were married recently.

Continued on page 54

LaMOTTE BLOOD CHEMISTRY SERVICE

NEW and IMPROVED
LaMOTTE FALLING DROP DENSIOMETER
(Two Models)

An important adjunct in treating cases of shock.
For determining blood proteins, albumin - globulin ratio and specific gravity of body fluids. These units are produced exclusively with the cooperation of H. G. Barbour and W. F. Hamilton, and approved by them.
This outfit is now available in two models—the larger model comes complete for $65 and the small model at $35. Prices F.O.B. Towson, Md.
Send for complete information.

This service includes a series of similar outfits for conducting the following accurate tests: Blood Sugar, Blood Urea, Sulfathiazole, Sulfapyridine, Sulfanilamide, Sulfadiazine and Sulfaguanidine in Blood and Urine. Icterus Index, Phenolsulphonthalein, Urine pH, Blood pH, Gastric Acidity, Calcium - Phosphorus, Blood Bromides.

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To Assure Quick Dependable Response
Discriminating Physicians are Prescribing
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THEOPHYLLINE-ETHYLENEDIAMINE

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ADEQUATE STIMULATION of Both the Upper and the Lower Bowel in HABITUAL CONSTIPATION

In the correction of habitual constipation, peristaltic activity in *both* the small and the large bowel must be effected in order to produce more than temporary results. Cholmodin, containing deoxycholic acid and extract of aloes, was designed specifically for this purpose. Its deoxycholic acid provides a stimulus to greater peristaltic construction in the jejunum and ileum. Through its choleretic action, the bile salt increases biliary secretion which also augments propulsion of small intestinal contents. Extract of aloes, activated promptly by deoxycholic acid, dependably increases colonic activity. Thus peristalsis in the entire bowel is augmented, overcoming constipation in a physiologic manner. Cholmodin is specifically indicated in atonic constipation and the constipation of the aged and obese. It is also an excellent occasional laxative.

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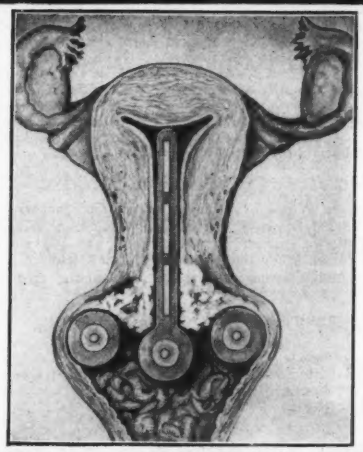
IMPROVE YOUR RESULTS IN CANCER OF THE CERVIX



CONSISTENTLY high percentages of 5-year cures in Carcinoma of the Cervix are reported by institutions employing the French technique illustrated here. Ametal rubber applicators encase the heavy primary screens and provide ideal secondary filtration to protect the vaginal mucosa. Radium or Radon applicators for the treatment of Carcinoma of the Cervix and provided with Ametal filtration are available exclusively through us. Inquire and order by mail, or preferably by telegraph or telephone reversing charges. Deliveries are made to your office or hospital for use at the hour you may specify.

THE RADIUM EMANATION CORPORATION
GRAYBAR BUILDING Tel. MUrray Hill 3-8636 NEW YORK, N. Y.

Continued from page 52

Dr. Sidney Richard Kaliski, San Antonio, and Miss Sophie Faverman, Albuquerque, New Mexico, were married recently.

DEATHS

Dr. Martin Armstrong, Merkel, aged 76, died recently of complications as a result of injuries received in a fall.

Dr. Darius Edrington, Avery, aged 60, died recently of cardiorenal hypertensive disease.

Classified Advertisements

WANTED—Residents in the Eye, Ear, Nose and Throat Hospital, New Orleans, Louisiana. Two-year combined residency with basic and clinical teaching supervised by departments of Ophthalmology and Otolaryngology of Tulane University. Two immediate appointments open, others available July 1st. Tuition fee waived for duration of the war. Reply to the Superintendent, stating military status.

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Our **ALCOHOLIC** treatment destroys the craving, restores the appetite and sleep, and rebuilds the physical and nervous condition of the patient. Liquors withdrawn gradually; no limit on the amount necessary to prevent or relieve delirium.

MENTAL patients have every comfort that their home affords.

The **DRUG** treatment is one of gradual Reduction. It relieves the constipation, restores the appetite and sleep; withdrawal pains are absent. No Hyoscine or rapid withdrawal methods used unless patient desires same.

NERVOUS patients are accepted by us for observation and diagnosis as well as treatment.

E. W. STOKES, Medical Director, Established 1904.
Telephone—Highland 2101

Dr. John Mitchell Johnson, Lieutenant (SG), Medical Corps, U. S. Naval Reserve, formerly of Longview, aged 51, was killed in action October 26, 1942, somewhere in the Pacific.

Dr. Frank Pulliam Smith, Fort Worth, aged 59, died recently of heart disease.

Dr. William A. Whitenburg, Lometa, aged 74, died recently of diabetes and heart disease.

VIRGINIA

Albemarle County Medical Society has elected Dr. David C. Wilson, President; Dr. Samuel A. Vest, Vice-President; and Dr. M. K. Humphries, Jr., Secretary-Treasurer, all of Charlottesville.

Northampton County Medical Society has elected Dr. W. T. Green, Nassawadox, President; Dr. J. M. Lynch, Cape Charles, Vice-President; and Dr. W. Carey Henderson, Nassawadox, Secretary, re-elected.

Patrick-Henry Medical Societies has elected Dr. W. N. Thompson, Stuart, President; and Dr. H. G. Hammond, Martinsville, Secretary-Treasurer.

Tri-State Association of the Carolinas and Virginia meeting which was scheduled to be held at Lynchburg has been cancelled. There will not be a 1943 meeting.

Virginia State Board of Medical Examiners will hold the next examinations in Richmond, March 24-27 instead of in June as heretofore. All applications must be in the hands of the Secretary, Dr. J. W. Preston, Roanoke, at least ten days in advance of examinations.

Dr. Eugene M. Landis, Head of the Department of Internal Medicine, University of Virginia School of Medicine, Charlottesville, has resigned to accept a place on the medical faculty at Harvard University. He will become George Higginson Professor of Physiology and will enter upon his duties July 1.

Dr. George A. Welchons, Richmond, has resigned as Superintendent of Pine Camp Sanatorium, to enter private practice.

Virginia Medical Society plans to begin a series of graduate courses on industrial and military medicine to be given in various sections of Virginia the first of March with three to five speakers on each program.

Dr. George M. Caldwell, formerly Resident Physician at the Greenbrier Hotel, White Sulphur Springs, has been commissioned a Lieutenant in the U. S. Navy and is stationed at Norfolk, Virginia.

Dr. Wm. T. Sanger, President, Medical College of Virginia, Richmond, has been elected President of the Richmond Chapter of the Virginia Cancer Foundation. Dr. Reuben F. Simms, Richmond, was named a new member of the Board of Trustees.

Dr. J. Hamilton Scherer, City Coroner of Richmond since October, 1936, has resigned and Dr. R. Manton Wilson has been appointed to the post. Dr. B. Black-Schaffer has been appointed Assistant Coroner.

Gill Memorial Eye, Ear and Throat Hospital, Roanoke, will hold its seventeenth annual spring graduate course April 5-10.

Dr. Randolph H. Hoge, Assistant Professor of Surgery, Medical College of Virginia, Richmond, has been elected a Fellow of the American College of Surgeons.

Dr. Charles James Frankel, University, and Miss Gladys Louise Birmingham, Buena Vista, were married January 8.

Dr. Carey Addison Stone, Jr., Crewe, and Miss Cornelia Daniel Preston, Lewisburg, West Virginia, were married January 7. Dr. Stone is a Lieutenant in the Medical Corps, U. S. A. Air Force, now stationed at Hunter Field, Savannah, Georgia.

DEATHS

Dr. Don Preston Peters, Lynchburg, aged 65, died January 20.

Dr. Henry Sycle Stern, Richmond, aged 49, died recently after a heart attack.

Dr. Robert Minor Wiley, Salem, aged 72, died January 5.

Dr. William Leslie Davenport, Amelia Court House, aged 81, died recently of coronory thrombosis.

WEST VIRGINIA

West Virginia State Medical Association will hold its seventy-sixth annual meeting at the Daniel Boone Hotel, Charleston, May 17-18.

DEATHS

Dr. George Hicks Davis, Hollidays Cove, aged 66, died recently of cerebral hemorrhage.

Dr. Ernest Hampton Updike, Mill Creek, aged 65, died recently of cerebral thrombosis.

JIMMY DIDN'T NEED A PSYCHIATRIST

Jimmy's mother feared he might become a "problem child" because he was apt to be dull, cranky and moody. But it didn't take the physician long to discover that the source of the trouble was strictly physiological—constipation in fact.

Relieving the costiveness which so frequently occurs in children may at times present a vexing problem which, however, the use of Loraga will solve in many cases. A fine mineral oil emulsion, Loraga softens and lubricates the intestinal contents, facilitating elimination without strain. It contains no laxative ingredients, and its palatability, free from oiliness, renders it acceptable to all tastes.

Send your request to the Department of Professional Service for a trial supply of Loraga.

LORAGA is available in convenient 16 ounce bottles.

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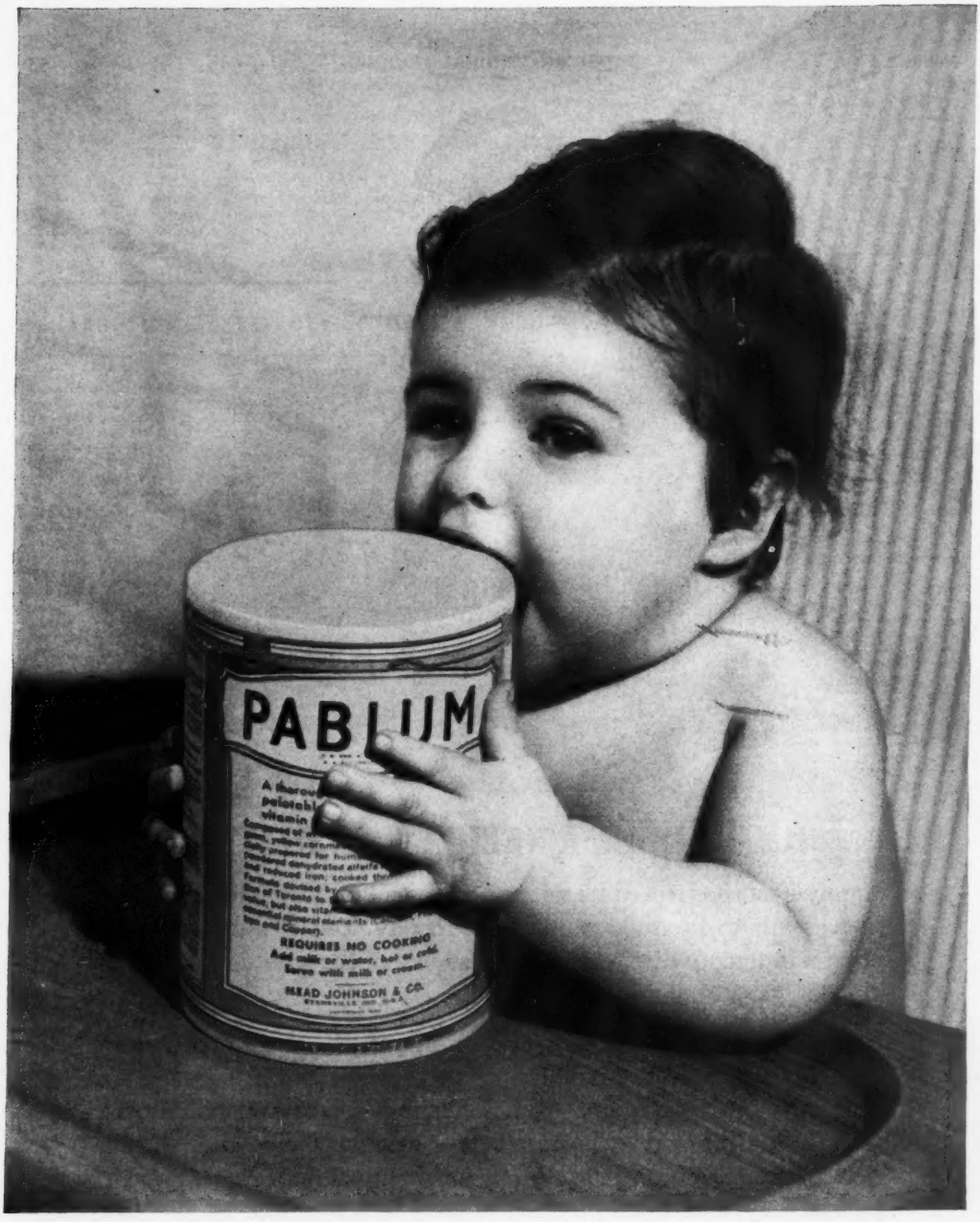

In response to requests from pediatricians, we are now also marketing PABENA—precooked oatmeal, enriched with vitamin and mineral supplements. PABENA closely resembles Pablum in nutritional qualities, and offers the same features of thorough cooking, convenience and economy. Supplied in 8-ounce cartons. Samples on request.

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Exigency of War

OLEUM PERCOMORPHUM 50% is now known as Oleum Percomorphum 50% with Viosterol. This product consists of the liver oils of percomorph fishes, viosterol, and fish liver oils, a source of vitamins A and D in which not less than 50% of the vitamin content is derived from the liver oils of percomorph fishes (principally Xiphias gladius, Pneumatophorus diego, Thunnus thynnus, Stereolepis gigas, and closely allied species).

In compliance with War Production Board Order L-40, to conserve vitamin A supplies during wartime, capsules of Mead's Oleum Percomorphum 50% With Viosterol now contain 83 mg. of oil, equivalent to 5,000 vitamin A units and 700 vitamin D units per capsule.

The new size capsule is now supplied in boxes containing 48 and 192 capsules—about twice the number of capsules without increase in price to the patient.

Contrary to rumors, the potency remains the same; namely 60,000 vitamin A units and 8,500 vitamin D units per gram.

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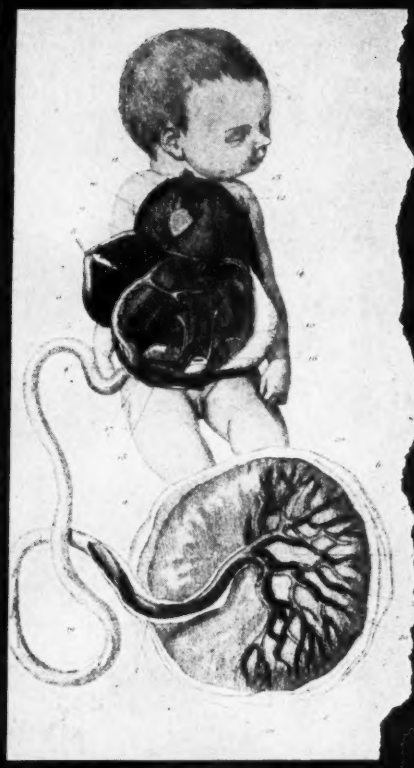

This interesting study of fetal circulation is taken from Antonin Bossu's Anthropologie Etude des Organes, Fonctions, Maladies de l'Homme et de la Dame published in Brussels in 1847.

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IF NEED for stimulation of labor arises in delivery rooms, obstetricians often rely upon Pitocin*, an oxytocic of many advantages and dependable performance.

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